Technologies & Solutions Pvt. Ltd.

INTERNSHIP REPORT

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Under the guidance of Zephyr Technologies, Mangalore

CHAPTER 1

ABOUT ZEPHYR TECHNOLOGIES

INTRODUCTION

Introduction to Zephyr Technologies and Solutions

Zephyr enterprise edition is the next generation set management system from D software, Inc.

Taking a realistic approach to how test/QA teams work, collaborate and interact with each other and the rest of the world, Zephyr brings together a comprehensive set of features, a slick UI and real-time capabilities at a price point that makes it very affordable for all team sizes. Test engineers designed Zephyr based on their multiple years of real world test experience in managing and running large and small test departments.

The Conept

Zephyr is based around a concept of Desktop & Dashboard. Every role in a Test/QA department has a customized web-based desktop with relevant applications that allow them to do their jobs quickly and efficiently, as they all share data from a centralized Zephyr server and communicate via a collaborative backbone. Dashboards are automated and live, keeping the whole company updated on every aspect of testing and product quality. The Zephyr server offers integrations to various Defect Tracking systems. The Z Bot, ZIP technologies and documented API's allows integrations with various automation tools.

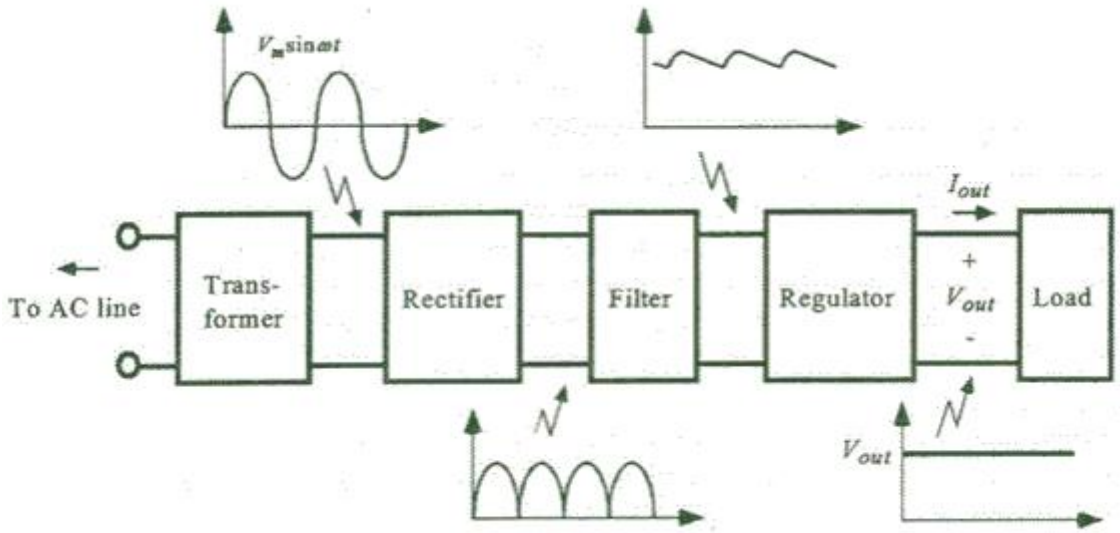
CHAPTER 2

ANALYSIS

2.1 REGULATED POWER SUPPLY

A regulated power supply is an embedded circuit; it converts unregulated AC (Alternating Current) into a constant DC. With the help of a rectifier it converts AC supply into DC. Its function is to supply a stable voltage (or less often current), to a circuit or device that must be operated within certain power supply limits. The output from the regulated power supply may be alternating or unidirectional, but is nearly always DC (Direct Current).

Modern regulated supplies mostly use a transformer, silicon diode bridge rectifier, reservoir capacitor and voltage regulator IC. There are variations on this theme, such as supplies with multiple voltage lines, variable regulators, power control lines, discrete circuits and so on. Switched mode regulator supplies also include an inductor.



Components of a typical linear power supply

2.1.1 OPERATION OF REGULATED POWER SUPPLY

STEP DOWN TRANSFORMER

A step down transformer will step down the voltage from the ac mains to the required voltage level. The turn's ratio of the transformer is so adjusted such as to obtain the required voltage value. The output of the transformer is given as an input to the rectifier circuit.

RECTIFICATION

Rectifier is an electronic circuit consisting of diodes which carries out the rectification process. Rectification is the process of converting an alternating voltage or current into corresponding direct (dc) quantity. The input to a rectifier is ac whereas its output is unidirectional pulsating dc. Usually a full wave rectifier or a bridge rectifier is used to rectify both the half cycles of the ac supply (full wave rectification). Figure below shows a full wave bridge rectifier.

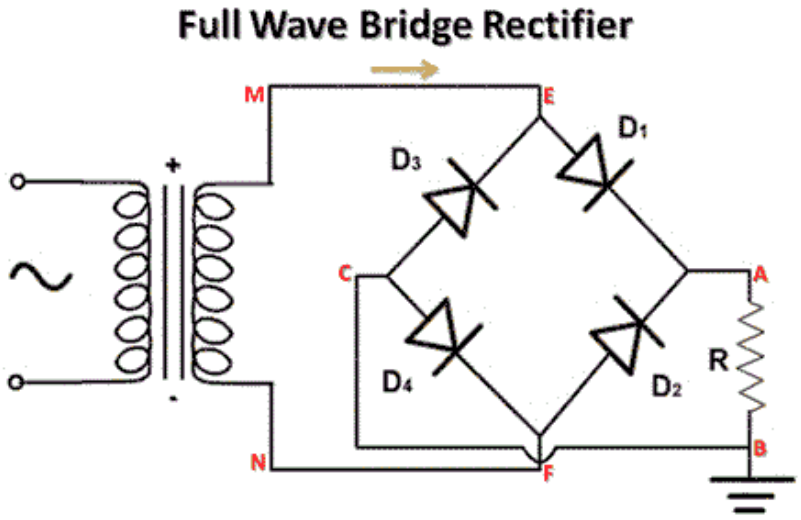


FIG 2.1.1 FULL WAVE BRIDGE RECTIFIER

A bridge rectifier consists of four p-n junction diodes connected in the above shown manner. In the positive half cycle of the supply the voltage induced across the secondary of the electrical transformer i.e. VMN is positive. Therefore point E is positive with respect to F. Hence, diodes D3 and D2 are reversed biased and diodes D1 and D4 are forward biased. The diode D3 and D2 will act as open switches (practically there is some voltage drop) and diodes D1 andD4 will act as closed switches and will start conducting. Hence a rectified waveform appears at the output of the rectifier as shown in the first figure. When voltage induced in secondary i.e. VMN is negative than D3 and D2 are forward biased with the other two reversed biased and An positive voltage appears at the input of the filter.

DC FILTERATION

The rectified voltage from the rectifier is a pulsating dc voltage having very high ripple content. But this is not we want, we want a pure ripple free dc waveform. Hence a filter is used. Different types of filters are used such as capacitor filter, LC filter, Choke input filter, π type filter. Figure below shows a capacitor filter connected along the output of the rectifier and the resultant output waveform.

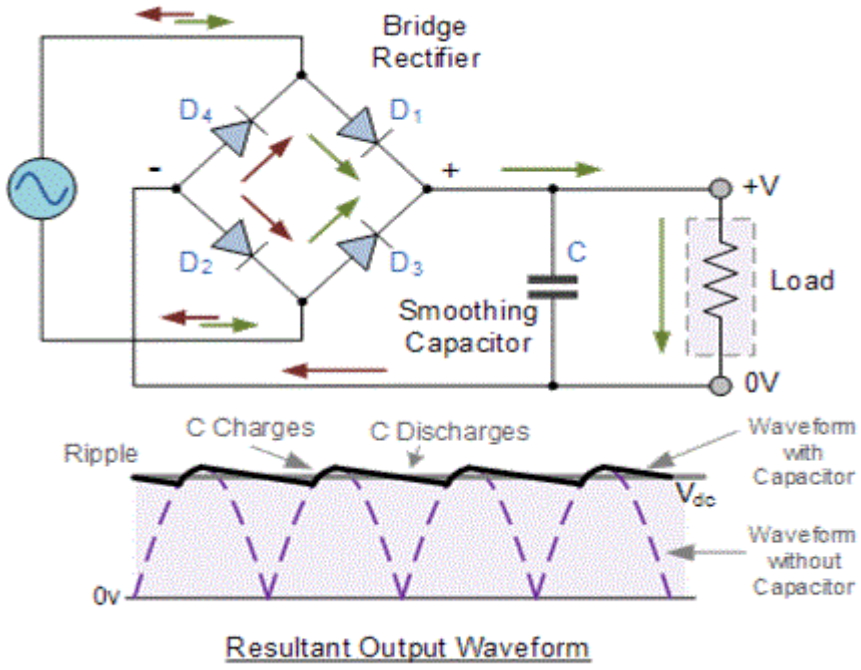


FIG 2.1.2 BRIDGE RECTIFIER AND RESULTANT WAVEFORM

As the instantaneous voltage starts increasing the capacitor charges, it charges till the waveform reaches its peak value. When the instantaneous value starts reducing the capacitor starts discharging exponentially and slowly through the load (input of the regulator in this case). Hence, an almost constant dc value having very less ripple content is obtained.

REGULATION

This is the last block in a regulated DC power supply. The output voltage or current will change or fluctuate when there is change in the input from ac mains or due to change in load current at the output of the regulated power supply or due to other factors like temperature changes. This problem can be eliminated by using a regulator. A regulator will maintain the

output constant even when changes at the input or any other changes occur. Transistor series regulator, Fixed and variable IC regulators or a zener diode operated in the zener region can be used depending on their applications. IC's like 78XX and 79XX are used to obtained fixed values of voltages at the output. With IC's like LM 317 and 723 etc we can adjust the output voltage to a required constant value.

2.1.2 APPLICATION OF REGULATED POWER SUPPLY

• D.C. variable bench supply (a bench power supply usually refers to a power supply capable of supplying a variety of output voltages useful for BE (bench testing) electronic circuits, possibly with continuous variation of the output voltage, or just some preset voltages; a laboratory (lab) power supply normally implies an accurate bench power supply, while a balanced or tracking power supply refers to twin supplies for use when a circuit requires both positive and negative supply rails).

• Mobile Phone power adaptors

• Regulated power supplies in appliances

• Various amplifiers and oscillators

2.2 LCD (LIQUID CRYSTAL DISPLAY) 16 X 2

Liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and seven-segment displays, as in a digital clock.

A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

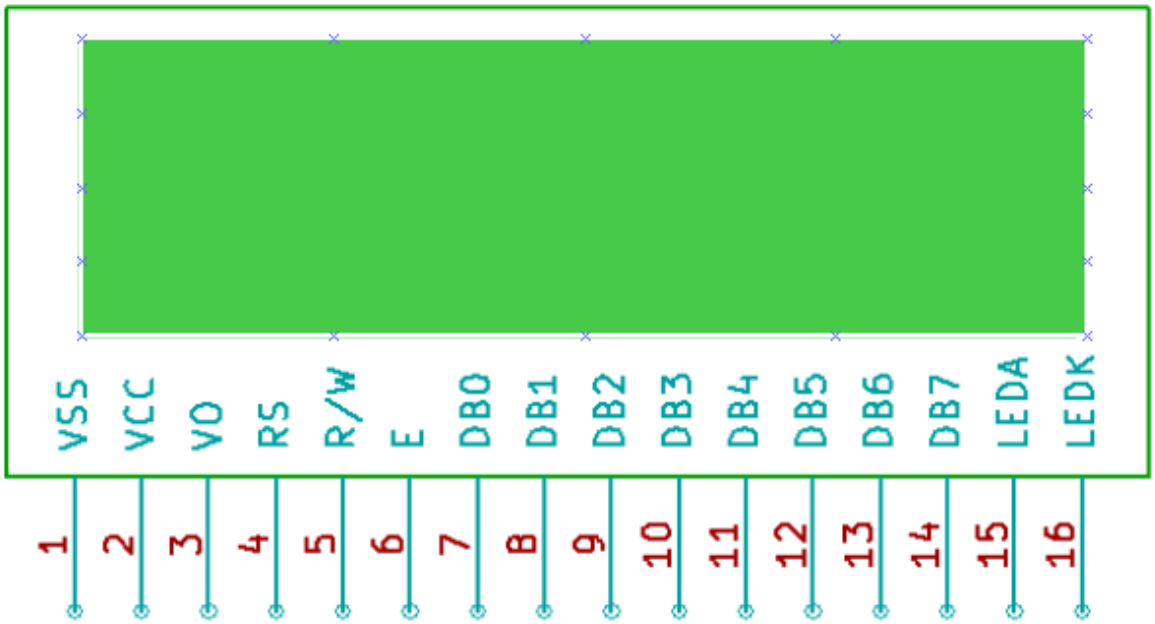


FIG 2.2.1 PIN DESCRIPTION

PIN DESCRIPTION

Pin No	Function	Name
1	Ground (0V)	Ground
2	Supply voltage; 5V (4.7V – 5.3V)	Vcc
3	Contrast adjustment; through a variable resistor	V_{EE}
4	Selects command register when low; and data register when high	Register Select
5	Low to write to the register; High to read from the register	Read/write
6	Sends data to data pins when a high to low pulse is given	Enable
7	8-bit data pins	DB0
8		DB1
9		DB2
10		DB3
11		DB4
12		DB5
13		DB6
14		DB7
15	Backlight V_{CC} (5V)	Led+
16	Backlight Ground (0V)	Led-

PINOUT DIAGRAM

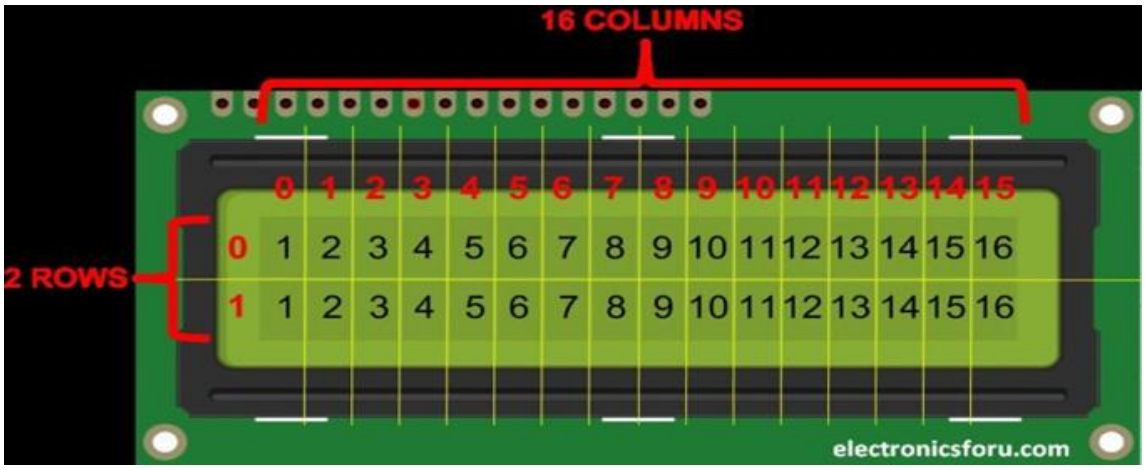


FIG 2.2.2 PINOUT DIAGRAM

2.3 TRANSISTOR BASED DRIVER FOR 12V SPDT RELAYS

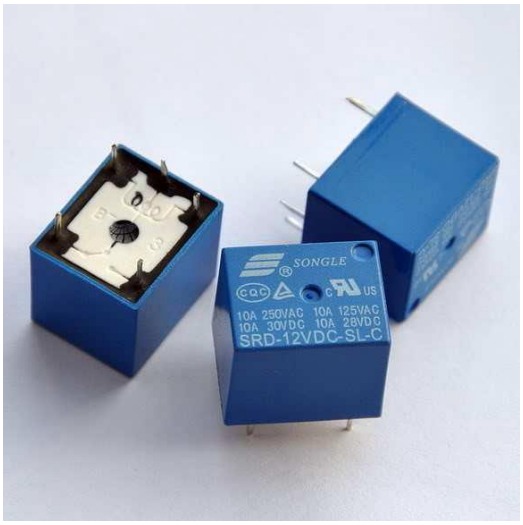


FIG 2.3.1 12V RELAY – SPDT (SINGLE POLE DOUBLE THROW)

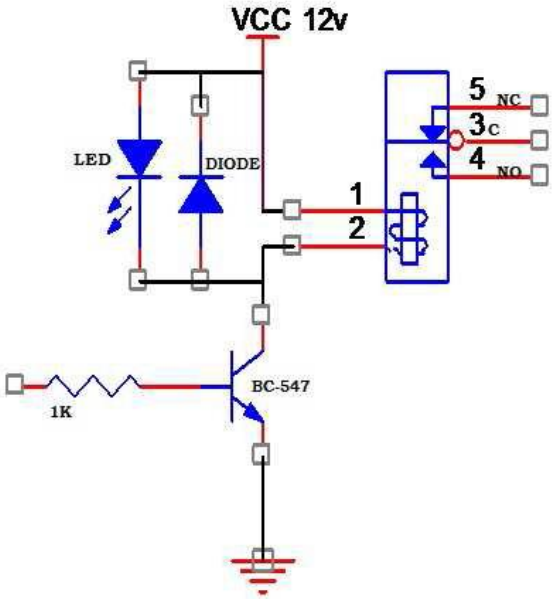


FIG 2.3.2 SCHEMATIC REPRESENTATION OF THE RELAY

C : COMMON

NC: NORMALLY CONNECT

NO: NORMALLY OPEN

2.3.1 DESCRIPTION

Above is the circuit of a relay driver using the NPN transistor BC 547. The relay is connected between the positive rail and the collector of the transistor. When the input signal passes through the 1 K resistor to the base of the transistor, it conducts and pulls the relay. IN 4007 diode eliminates back e.m.f when the relay switches off and protects the transistor. LED indicates the on status of the relay.

2.3.2 WORKING:

The coils of the relay (1,2) are connected to +12V and collector of the transistor respectively. When Logic high is given as an input to the transistor base through some resistance, it conducts and provides the ground to pin(2) of the coils to complete the circuit and switch ON the relay. As Relay switches ON , C and NO will be in contact. When the input to the transistor base is at Logic Low, the relay will be in OFF state and C will be in Contact with NC.

CHAPTER 3

ARDUINO UNO – R3 ARCHITECTURE

3.1 OVERVIEW

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. Revision 2 of the Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode. Revision 3 of the board has the following new features:1.0 pinout: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible both with the board that use the AVR, which operate with 5V and with the Arduino Due that operate with 3.3V. The second one is a not connected pin, that is reserved for future purposes. Stronger RESET circuit.Atmega 16U2 replace the 8U2.

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

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

FIG 3.1 ARDUINO UNO R3

Arduino is an open-source physical computing platform based on a simple i/o board and a development environment that implements the Processing/Wiring language. Arduino can be used to develop standalone interactive objects or can be connected to software on your computer (e.g. Flash, Processing, MaxMSP). The open-source IDE can be downloaded for free (currently for Mac OS X, Windows, and Linux).

3.2 RFID READER

RFID stands for Radio Frequency Identification. RFID is one member in the family of Automatic Identification and Data Capture (AIDC) technologies and is a fast and reliable means of identifying objects. There are two main components: The Interrogator (RFID Reader) which transmits and receives the signal and the Transponder (tag) that is attached to the object. An RFID tag is composed of a miniscule microchip and antenna. Communication between the RFID Reader and tags occurs wirelessly and generally does not require a line of sight between the devices. The RFID Reader emits a low-power radio wave field which is used to power up the tag so as to pass on any information that is contained on the chip. In addition, readers can be fitted with an additional interface that converts the radio waves returned from the tag into a form that can then be passed on to another system, like a computer or any programmable logic controller. Passive tags are generally smaller, lighter

and less expensive than those that are active and can be applied to objects in harsh environments, are maintenance free and will last for years. These transponders are only activated when within the response range of an RFID Reader. Active tags differ in that they incorporate their own power source, where as the tag is a transmitter rather than a reflector of radio frequency signals which enables a broader range of functionality like programmable and read/write capabilities.

3.2.1 RFID APPLICATIONS

RFID is used for many applications such as: Automated electronic toll stations which can identify vehicles passing through without having to stop and then debits their account. Identify and monitor railcars and containers. RFID tags help farmers track their farm animals, and is used in wildlife conservation. Also helps to identify our animal companions if they should ever become lost. Customers can pay for their fuel at the pump with just a wave of their key tag. An increase in demand has been seen for security applications such as homeland security, employee identification, gaining entrance and controlling access of vehicles to buildings, gated communities, corporate campuses and airports.

Some other current uses for RFID include waste management, automating parking and managing traffic, the dispensing of all types of products, providing ski lift access, the tracking of library books and more. Major growth in the future of RFID will come from real-time location systems (RTLS), asset management, baggage handling and cash less payment systems. Business segments such as retail, logistics, warehousing and manufacturing will greatly benefit from an increase in supply chain visibility that RFID can create.

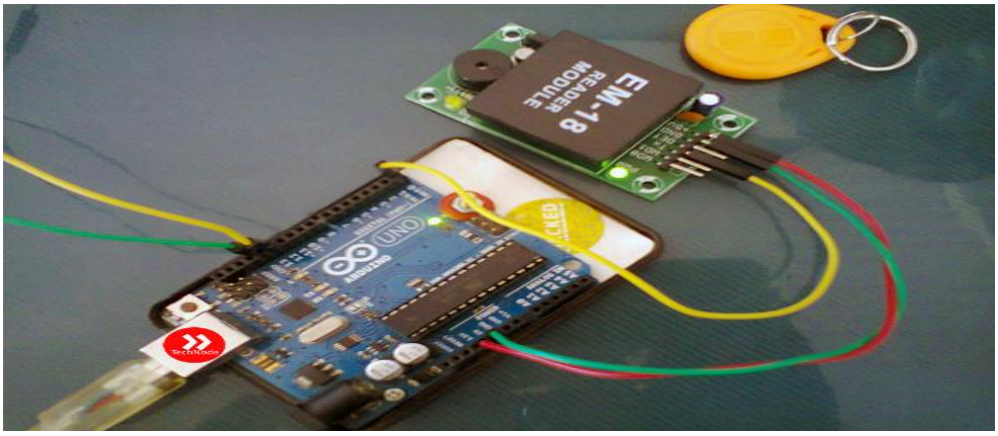


FIG 3.2.1 RFID MODULE

3.3 IR SENSOR

Infrared sensors can be passive or active. Passive infrared sensors are basically Infrared detectors. Passive infrared sensors do not use any infrared source and detects energy emitted by obstacles in the field of view. They are of two types: quantum and thermal. Active infrared sensors consist of two elements: infrared source and infrared detector. Infrared sources include an LED or infrared laser diode. Infrared detectors include photodiodes or phototransistors. The energy emitted by the infrared source is reflected by an object and falls on the infrared detector.

3.3.1 IR SENSOR APPLICATIONS

IR image device is one of the major applications of IR waves, primarily by virtue of its property that is not visible. It is used for thermal imagers, night vision devices, etc.

IR sensors form a part of flame monitors which are devices used for detecting the light emitted from the flames and to monitor how the flames are burning.

3.3 ULTRASONIC SENSOR

Ultrasonic sensors measure distance by using ultrasonic waves.The sensor head emits an ultrasonic wave and receives the wave reflected back from the target. Ultrasonic Sensors measure the distance to the target by measuring the time between the emission and reception. An optical sensor has a transmitter and receiver, whereas an ultrasonic sensor uses a single ultrasonic element for both emission and reception. In a reflective model ultrasonic sensor, a single oscillator emits and receives ultrasonic waves alternately. This enables miniaturization of the sensor head.

3.3.1 ULTRASONIC SENSOR APPLICATIONS

Ultrasonic sensors are used in object detection. They are widely used for distance measurement.

3.4 ACCELEROMETER

An accelerometer measures proper acceleration, which is the acceleration it experiences relative to freefall and is the acceleration felt by people and objects.

An accelerometer is an electromechanical device that will measure acceleration forces. These forces may be static, like the constant force of gravity pulling at your feet, or they could be dynamic - caused by moving or vibrating the accelerometer.

By measuring the amount of static acceleration due to gravity, you can find out the angle the device is tilted at with respect to the earth. By sensing the amount of dynamic acceleration, you can analyze the way the device is moving.

3.4.1 ACCELEROMETER APPLICATIONS

Accelerometers can be used to measure vibration on cars, machines, buildings, process control systems and safety installations. They can also be used to measure seismic activity, inclination, machine vibration, dynamic distance and speed with or without the influence of gravity.

Accelerometers are also used for machinery health monitoring to report the vibration and its changes in time of shafts at the bearings of rotating equipment such as turbines, pumps,fans, rollers, compressors.

CHAPTER 4

INTERFACES

4.1 INTERFACING A 16X2 LCD

4.1.1 COMPONENTS REQUIRED:

- Arduino UNO R3
- 16*2 LCD Display

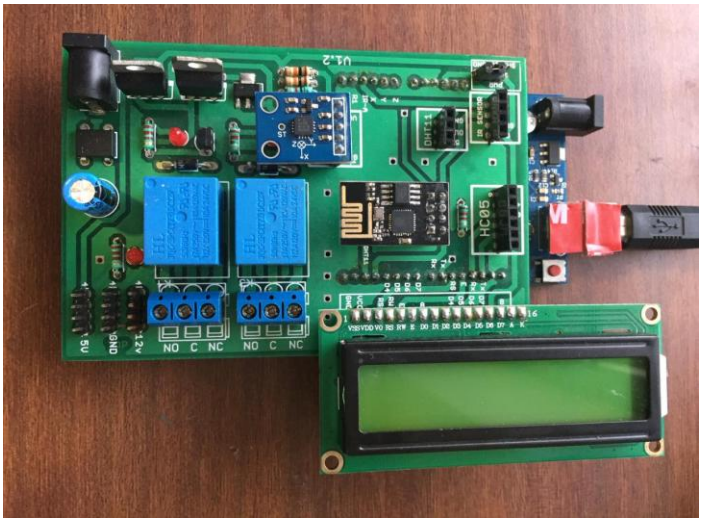
4.2.2 DESCRIPTION:

The system consists of an Arduino UNO R3 and a 16*2 LCD which is used to display the status messages. Here, the connections from Arduino Board with pins RS, Enable, D4, D5,D6, D7 are connected to the pins 10, 11, 4, 5, 6, 7 respectively of the 16*2 LCD. The conditions are mentioned in the program for the LCD to display the required message. The program is then compiled and uploaded to the Arduino Board that executes the program.

4.2.3 APPLICATIONS:

This can be used to display small messages, generally to display one line and numerical outputs.

4.2.4 RESULT:



4.2 INTERFACING A RELAY WITH ARDUINO

4.2.1 COMPONENTS REQUIRED:

- Arduino Uno R3
- 12V SDPT Relay
- 16 * 2 LCD
- Regulated Power Supply
- Switch

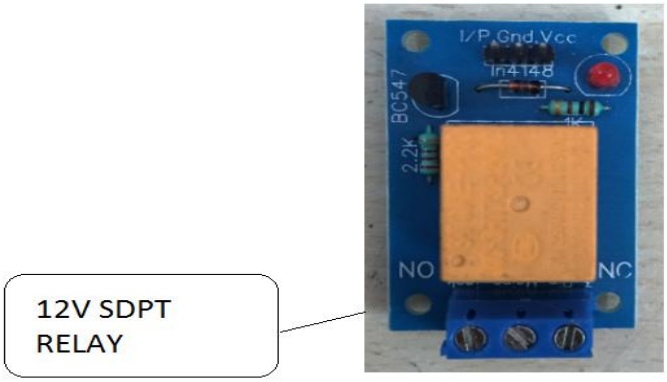


FIG 4.2.1 12V SPDT RELAY

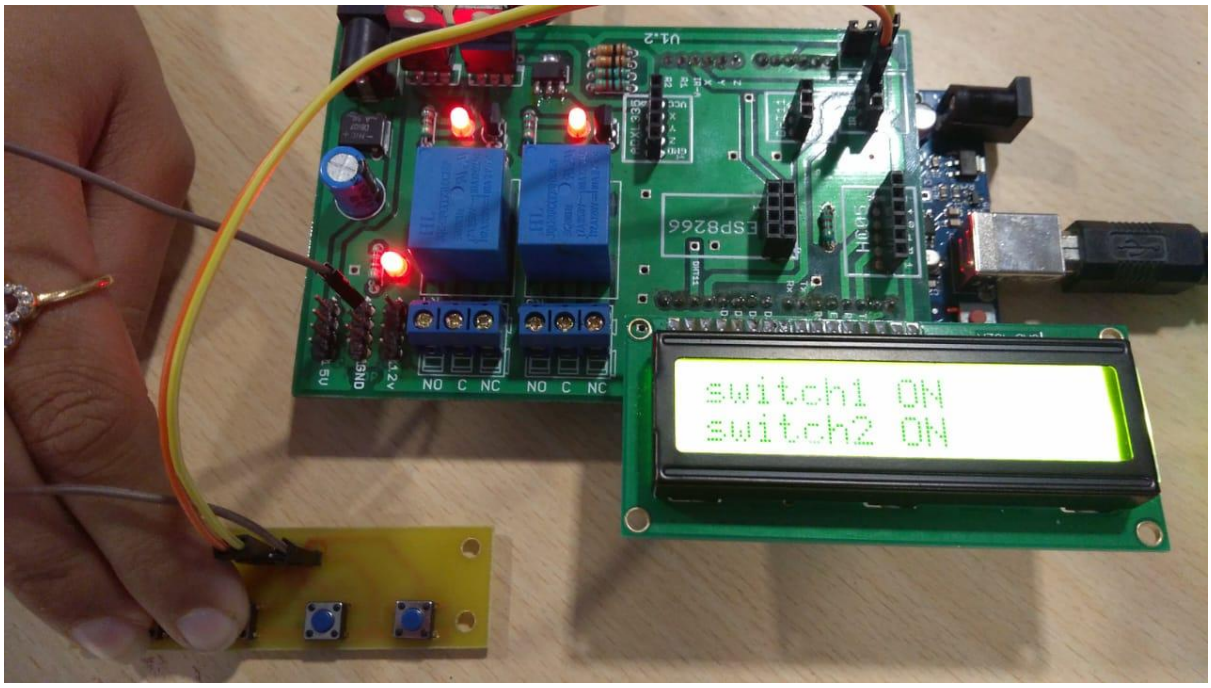
4.2.2 DESCRIPTION:

Here, the 2 main components are the 12 V SPDT relay and the voltage comparator circuit that has been interfaced with the Arduino UNO R3.The 12 V relay is a single pole double throw switch which has 3 terminals, the common, the normally connected and the normally open terminal. The connections from the relay are given to the power supply. The other component that gets connection from the power supply is the voltage comparator circuit, which is connected to the data pins of the Arduino board as input. The voltage comparator circuit uses an Opamp. These are used to basically compare the voltages and are used in the IRs, sensors, thermistors. In the Arduino board there are 2 relays present. Hence we can use switches to turn on any 1 or both of the relays at a given point of time.

4.2.3 APPLICATIONS:

Relay can be used in motor control. They is generally used in applications where control of high voltages and currents is required.

4.2.4 RESULT:



4.3 INTERFACING A 125 KHz RFID READER

4.3.1 COMPONENTS REQUIRED:

- Arduino UNO R3
- RFID Reader Module
- Regulated Power Supply
- 16*2 LCD

4.3.2 DESCRIPTION:

RFID stands for Radio Frequency Identification.There are two main components: The Interrogator (RFID Reader) which transmits and receives the signal and the Transponder (tag) that is attached to the object. An RFID tag is composed of a miniscule microchip and antenna. RFID tags can be passive or active and come in a wide variety of sizes, shapes, and forms. Communication between the RFID Reader and tags occurs wirelessly and generally does not require a line of sight between the devices. An RFID Reader can read through most anything with the exception of conductive materials like water and metal, but with modifications and positioning, even these can be overcome. The RFID Reader emits a low-power radio wave field which is used to power up the tag so as to pass on any information that is contained on the chip. In addition, readers can be fitted with an additional interface that converts the radio waves returned from the tag into a form that can then be passed on to another system, like a computer or any programmable logic controller. Passive tags are generally smaller, lighter and less expensive than those that are active and can be applied to objects in harsh environments, are maintenance free and will last for years. These transponders are only activated when within the response range of an RFID Reader. Active tags differ in that they incorporate their own power source, whereas the tag is a transmitter rather than a reflector of radio frequency signals which enables a broader range of functionality like programmable and read/write capabilities.

4.3.3 APPLICATIONS:

They are generally used in inventory or asset tracking. Certain areas require an expected level of security and access. From doors to parking lots, RFID access control tags restrict access to only those pre-approved. They can also be used to track vehicles, animals and even people.

4.3.4 RESULT:

4.4 INTERFACING AN ULTRASONIC SENSOR WITH LCD AS A DISTANCE METER

4.4.1 COMPONENTS REQUIRED:

- Arduino UNO R3
- Regulated Power Supply
- 16*2 LCD
- Distance Meter HC-SR04

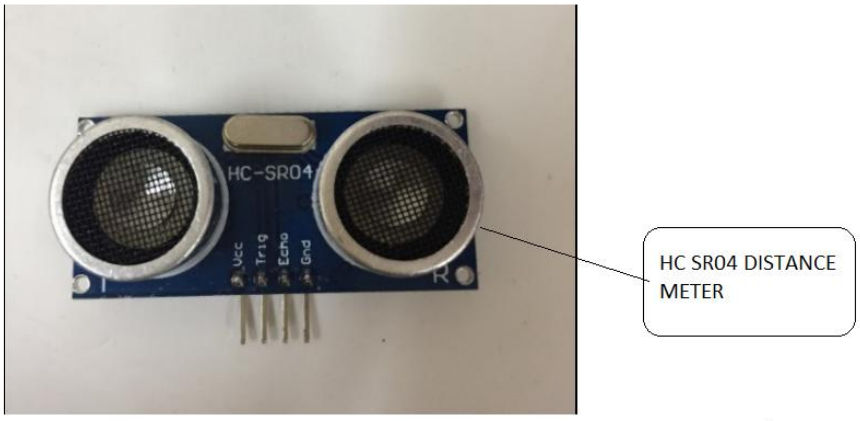


FIG 4.4.1 DISTANCE METER HC SR04

4.4.2 DESCRIPTION:

HCSR04 Ultrasonic Sensor is interfaced with Arduino to measure the distance of any far away or any incoming objects. A 16X2 LCD is used to display the distance parameters. Arduino is programmed to send a pulse through the trigger pin of HCSR04 and monitors the received signal in the echo pin. Based on the time duration between the transmitted and received pulses, the distance is calculated. This could be used for various applications like parking sensors, wireless measuring tools in civil constructions etc.

4.4.3 APPLICATIONS:

This could be used for various applications like parking sensors, wireless measuring tools in civil constructions etc.

4.5 INTERFACING IR SENSOR FOR OBSTACLE DETECTION

4.5.1 COMPONENTS REQUIRED:

- Arduino Uno R3.
- Regulated Power Supply.
- 16*2 LCD Display.
- IR Sensor.

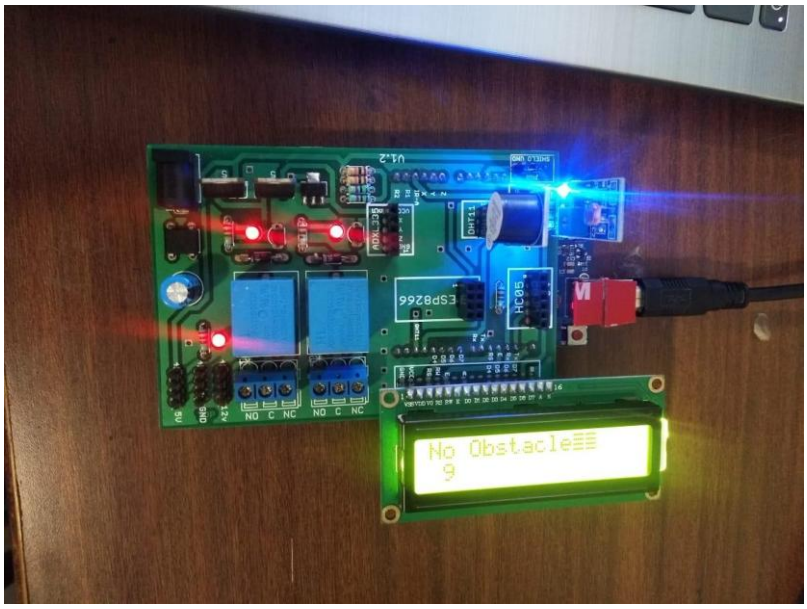
4.5.2 DESCRIPTION:

An IR sensor is interfaced with Arduino to check if an obstacle is present in the given area. The LCD is used to display if an obstacle is present or not. The IR sensor transmits light and has a receiver to detect the light that is bounced back if an obstacle is present.

4.5.3 APPLICATIONS:

IR sensors are used in night vision goggles. They are also used to create a thermal map of the given area.

4.5.4 RESULT:



4.6 INTERFACING A TILT SENSOR WITH ARDUINO

4.6.1 COMPONENTS REQUIRED

- Arduino Uno R3
- Regulated Power Supply
- 16*2 LCD Display
- Accelerometer (Tilt Sensor)

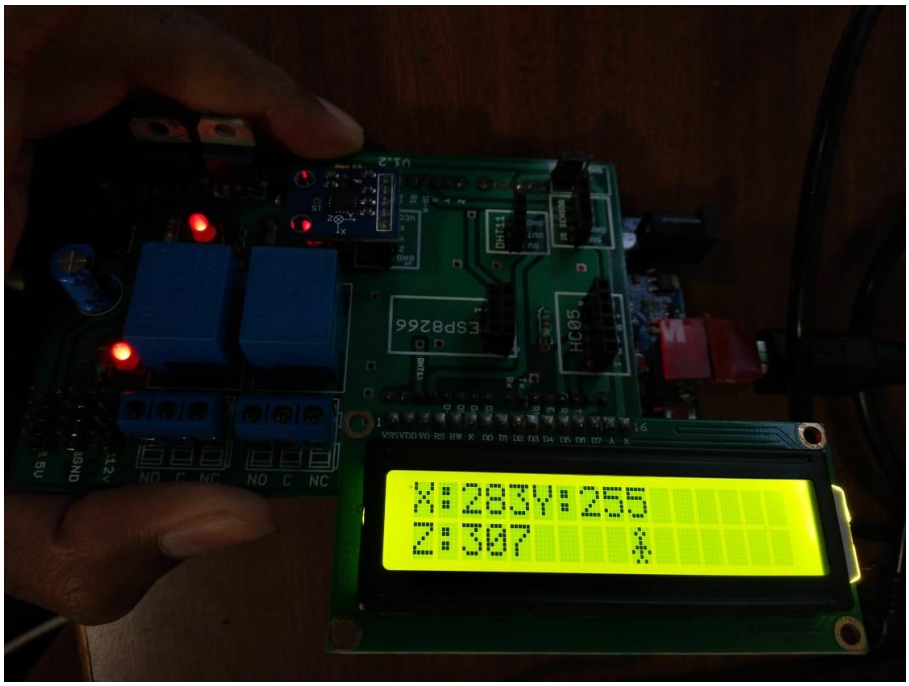
4.6.2 DESCRIPTION:

The accelerometer is connected to the Arduino shield board and interfaced with it to measure tilt. This sensor can be used to measure tilt in X, Y,Z planes. Whenever there is a change in orientation of the board to which the sensor is connected, the change in 3 dimensional planes is measured and the values can be displayed on an LCD.

4.6.3 APPLICATIONS:

Accelerometers are widely used in mobile phones for automatic screen rotation. They can also be used to measure seismic activity, inclination, machine vibration, dynamic distance and speed with or without the influence of gravity.

4.6.4 RESULT:



4.7 HAZARD DETECTION SYSTEM

4.7.1 ABSTRACT

Safety plays a major role in today's world and it is necessary that good safety systems are to be implemented in places of education and work. This system modifies the existing safety model installed in industries and this system can also to be used in homes and offices.

The main objective of the project is designing Arduino based hazard detection system. The advantage of this automated detection and alerting system over the manual method is that it offers quick response time and accurate detection of an emergency.

Though there are several advancements in technology, only a very few of them are concentrated on predicting and detecting natural disasters such as Earthquake, Tsunami and such others. But using technology in these areas would save lives by warning people about the disaster at an earlier time. Hence, the objective is to come up with a cost-effective device which can detect fire and natural disasters and can be implemented in any remote area.

The scope of this device is to send alerts to people in advance of any disaster. It uses a Wi-Fi module which needs internet and sends data to the app installed on android phones.

In order to achieve this, a Wi-Fi module is interfaced to the Arduino board, TCP/UDP terminal application on the cell phone sends the commands to the receiver that is connected. Hazard detecting system developed here uses LDR sensor in order to detect the fire. As soon

as the fire is detected it alerts the people by switching on the buzzer and it also turns on the sprinkler system. This system can also be used to detect the earthquake by using the accelerometer or tilt sensor. The sensed message will be sent to people through Wi-Fi system and it is also displayed in the LCD display.

The objective of Fire & earthquake Detection system is to,

1. Minimize the risk and consequences of an accidental event.

2. Minimize the potential for hazardous occurrences

3. Ensure a safe working environment for personnel

4. Ensure adequate means of escape are provided

5. Provide appropriate fire protection systems to rapidly bring under control and extinguish any reasonably foreseeable fire which could develop during normal operations.

4.7.2 COMPONENTS REQUIRED:

- Arduino Uno R3
- Regulated Power Supply
- 16*2 LCD Display
- Motor
- 12V SPDT Relay
- Buzzer
- Accelerometer
- LDR
- ESP8266 WIFI Module

4.7.3 DESCRIPTION

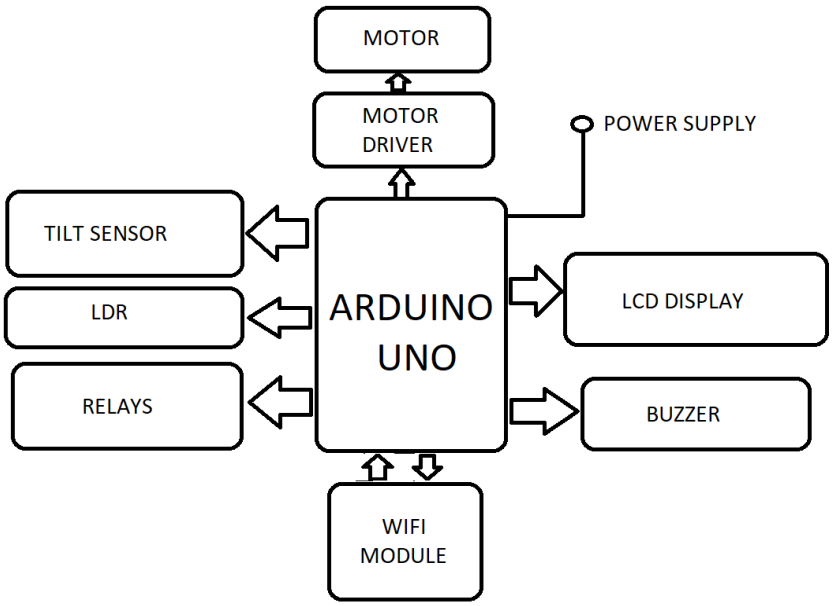
The hazard system designed here detects earthquakes and fire threats. The monitoring system is constantly active and as soon as fire or earthquake is detected a message is sent to the

concerned person and fire department and the siren is switched on. In case of fire, a sprinkler system is initiated. There is also a provision for the person who receives the message to switch off or on the power supply and gas supply of the building.

Accelerometer detects the change in axis (x, y, z) values and indicates earthquake if the tilt is beyond the safety values. The tilt going beyond the safety value also causes the buzzer to turn on. In addition to this a message is sent to the person in charge and the fire department.

LDR is used to detect fire in the building. As LDR goes to low state the buzzer turns on and signal is given to drive the motor. The message will be sent to the person through Wi-Fi module. The person can send a message from his mobile phone to the system to push the relays to high or low state in order to turn on or turn off the power supply or gas supply of the building.

4.7.4 BLOCK DIAGRAM



4.7.5 APPLICATIONS:

This system can be implemented in apartments, hotels, educational institution, shopping malls and all kinds of industries.

4.7.6 RESULTS: