CHAPTER-1

INTRODUCTION

1.1 LITRERY SURVEY

In this section, we will present there are no available in the market and also the recent advancements in the research working in this area. Most of the state-of- the-art systems today can be integrated with Automation & IOT.

To give some context to the reader, IOT is the acronym of If This, and affordable way to get started with smart Fault detecting.

It allows you to control the Faults of your Transformer using sensors and the IOT.It is an initiative in the Internet of Things space where several services can be integrated to provide a robust solution. The following are some of the successful smart Fault detection products available today.

HC-SR04 , The ultrasonic receiver would stop timing when it received the reflected wave. As Ultrasonic spread velocity is 340m / s in the air, based on the timer record **t**, we can calculate the distance (s) between the obstacle and transmitter, namely: s = 340t / 2.

- Gas Sensor (MQ9) module is useful for gas leakage detecting (in home and industry). It can detect LPG, CO, and CH4. Based on its fast response time. Measurements can be taken as
soon as possible. Also the sensitivity can be adjusted by the potentiometer.

The LM35 device does not require any external calibration or trimming to provide typical ac-curacies of ±¼°C at room temperature and ±¾°C over a full −55°C to 150°C temperature range. Lower cost is assured by trimming and calibration at the wafer level.

The Arduino Mega2560 can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack.

CHAPTER-2

SYSTEM HARDWARE DESIGN

2.1 PHYSICAL LAYERS :

1. HC-SR04 It is used to detect the Ultra sonic radiations from the transformer.
2. Gas Sensor (MQ9) it's used to sense the gas leakages from the transformer.
3. LM35 It's an temperature detector in the transformer.
4. 5A Range AC Current Transformer Current Sensor Module
5. Arduino Board Mega 2560
6. Solid State Relays

2.2 DEVICES

2.2.1 *HC-SR04 User Guide*

Ultrasonic transmitter emitted an ultrasonic wave in one direction, and started timing when it launched. Ultrasonic spread in the air, and would return immediately when it encountered obstacles on the way. At last, the ultrasonic receiver would stop timing when it received the reflected wave.

As Ultrasonic spread velocity is 340m / s in the air, based on the timer record **t**, we can calculate the distance (s) between the obstacle and transmitter, namely: s = 340t / 2, which is so- called time difference distance measurement principle

In the formula, L is the measured distance, and C is the ultrasonic spreading velocity in air, also, T represents time (T is half the time value from transmitting to receiving).

Fig,2.1 HC-SR04 user guide

The principle of ultrasonic distance measurement used the already-known air spreading velocity, measuring the time from launch to reflection when it encountered obstacle, and then calculate the distance between the transmitter and the obstacle according to the time and the velocity. Thus, the principle of ultrasonic distance measurement is the same with radar. Distance Measurement formula is expressed as: L = C X T

Set low the Trig and Echo port when the module initializes , firstly, transmit at least 10us high level pulse to the Trig pin (module automatically sends eight 40K square wave),

And then wait to capture the rising edge output by echo port, at the same time, open the timer to start timing.

Next, once again capture the falling edge output by echo port, at the same time, read the time of the counter, which is the ultrasonic running time in the air. According to the formular: test distance = (high level time * ultrasonic spreading velocity in air) / 2, you can calculate the distance to the obstacle.

2.2.2 *Gas Sensor (MQ9) module*

The Grove - Gas Sensor (MQ9) module is useful for gas leakage detecting (in home and industry). It can detect LPG, CO, and CH4. Based on its fast response time. Measurements can be taken as soon as possible. Also the sensitivity can be adjusted by the potentiometer.

Sensitive material of MQ-9 gas sensor is SnO2, which with lower conductivity in clean air. It make detection by method of cycle high and low temperature, and detect CO when low temperature (heated by 1.5V).

The sensor's conductivity is more higher along with the gas concentration rising. When high temperature (heated by 5.0V), it detects Methane, Propane etc combustible gas and cleans the other gases adsorbed under low temperature.

Please use simple electrocircuit, Convert change of conductivity to correspond output signal of gas concentration. MQ-9 gas sensor has high sensitity to Carbon

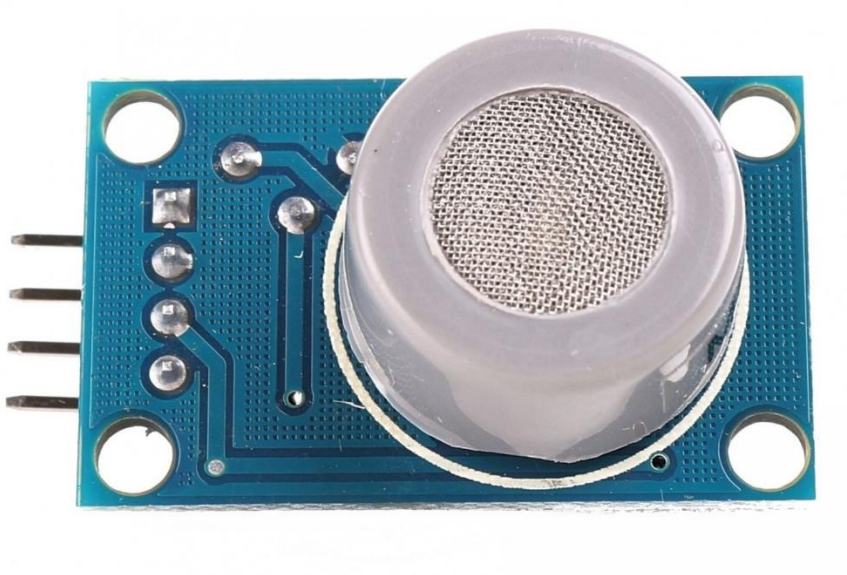


Fig. 2.2 Gas Sensor (mq9) Module

Monoxide, Methane and LPG. The sensor could be used to detect different gases contains CO and combustible gases, it is with low cost and suitable for different application.

2.2.3 LM*35 Temperature Sensors*

The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 device does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full −55°C to 150°C temperature range. Lower cost is assured by trimming and calibration at the wafer level.

The low-output impedance, linear output, and precise inherent calibration of the LM35 device makes interfacing to readout or control circuitry especially easy.

The device is used with single power supplies, or with plus and minus supplies. As the LM35 device draws Only 60 μA from the supply, it has very low self-heating of less than 0.1°C in still air. The LM35 device is rated to operate over a −55°C to

150°C temperature range, while the LM35C device is rated for a −40°C to 110°C range (−10° with improved accuracy).

Fig 2.3 LM35 Temperature Sensors

The LM35-series devices are available packaged in hermetic TO transistor packages, while the LM35C, LM35CA, and LM35D devices are available in the plastic TO-92 transistor package. The LM35D device is available in an 8-lead surface-mount small-outline package and a plastic TO-220 package.

2.2.4 *5A Range AC Current Transformer Current Sensor Module*

Current sensors operate as the sealed secondary of a current transformer while the conductor carrying the current to be measured functions as a one turns primary.

Measurement accuracy can be improved by increasing the number of primary turns. Applications include detection of branch circuit overload and load drop or shutdown.

It is a line of fully integrated Hall-effect current sensor IC that provide highly accurate, low noise output voltage signals that are proportional to an applied AC or DC current.

Fig. 2.4 5A AC Current Sensor Module Range

These ICs are in high volume production in many applications, including automotive HEV inverters and electronic power steering (EPS) systems, and in industrial and consumer inverters.

Current sensor ICs allow design engineers to use Hall-effect-based current sensor ICs in new applications where increased energy efficiency or new operating features are required.

2.2.5

Arduino Mega2560

The Arduino Mega2560 can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can

come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack.

Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts

. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board.

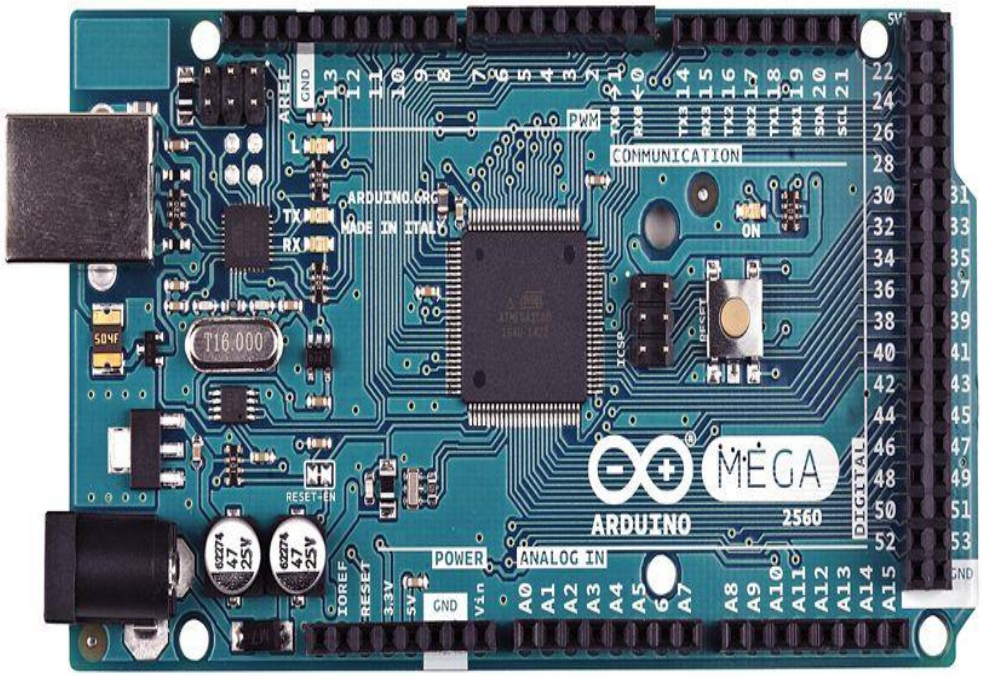


*Fig. **2.5** Arduino Mega2560*

The recommended range is 7 to 12 volts. The Mega2560 differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter.

2.2.8 3-*PHASE SOLID STATE RELAYS*

Solid State Relays are used in a wide variety of electrical load-switching applications, including Professional Cooking Equipment, Plastics Machinery, Packaging Machinery, Lighting Systems, Medical Equipment, Laboratory Ovens, Beverage Dispensing Equipment, HVAC&R systems, and many other industrial or commercial applications.

However, for the purpose of understanding these applications relative to the use of SSRs for their control, the vast majority of loads can be grouped into two primary

categories: heating and motion control. Obviously this is not an all-inclusive grouping as there are other applications outside of the scope of these two categories such as lighting and power distribution systems.

Fig. 2.6 3-Phase Solid State Relays

However, a majority of Design Engineers specifying SSRs apply them to one of these two general types of three phase loads

2.3 SYSTEM ARTITECHTURE

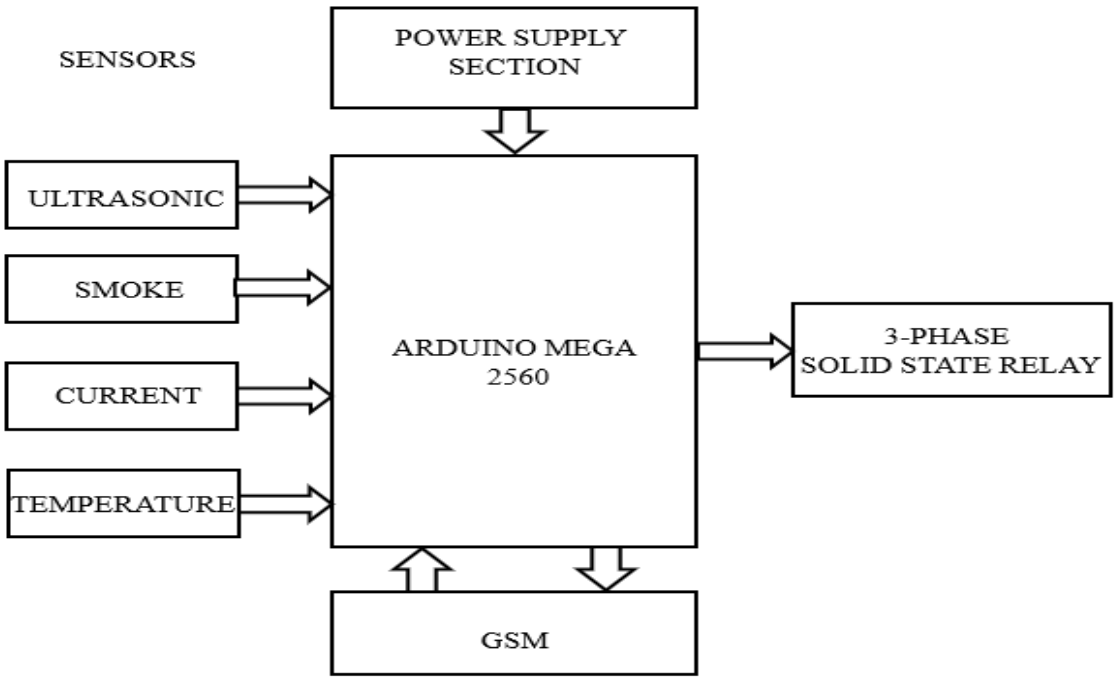


Fig 2.7 System Architect

As Automation as became a part an parcel of out daily life necessary electrical (or) electronics and mechanical equipment. And made out of Life easy and reliable. Our project (Transformer Failure detection and response) is one if the project that makes the transfer maintenance and monitoring easy. As transformer

2.4 SCHEMATIC BLOCK DIAGRAM (ENTIRE PROJECT)

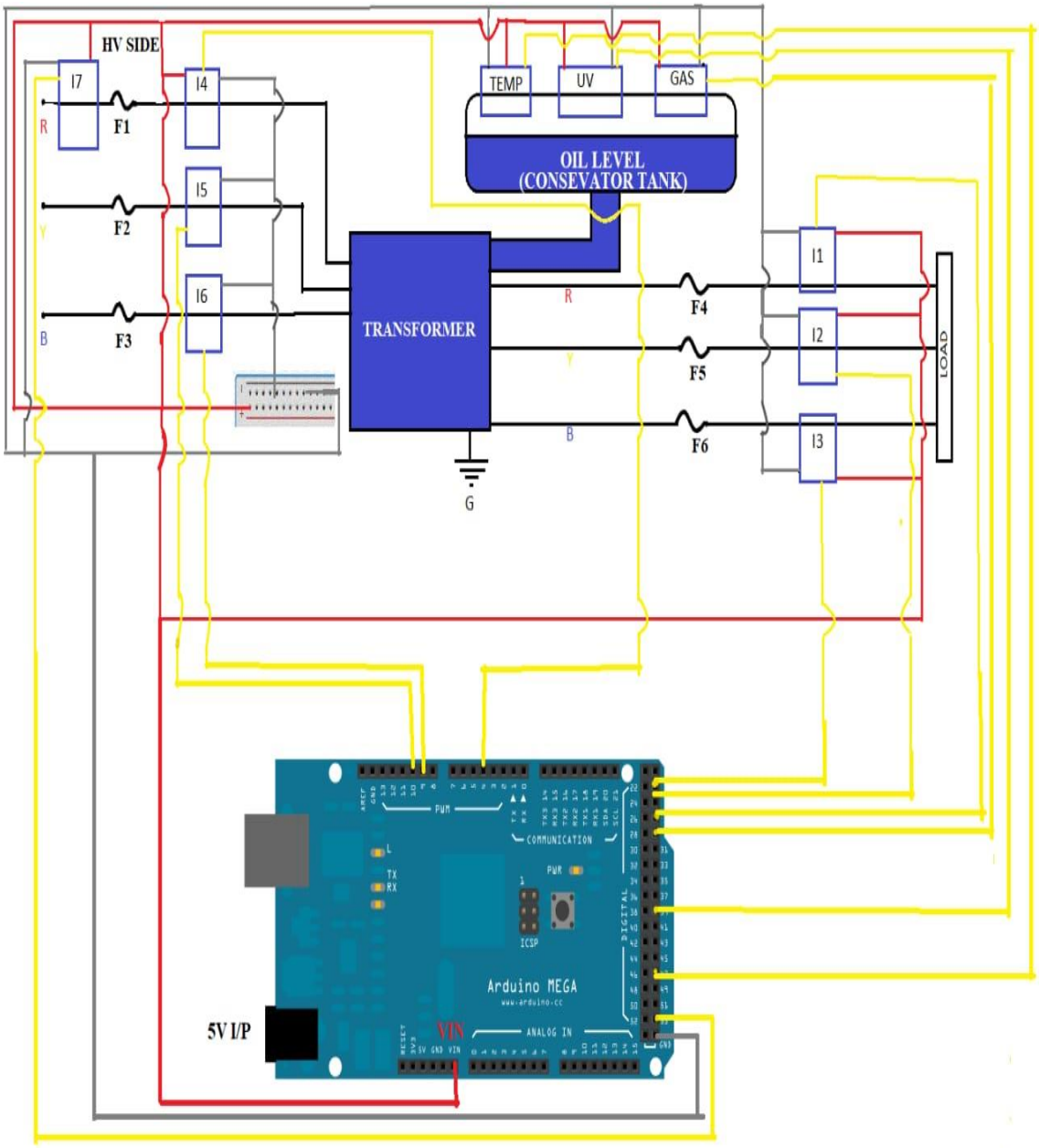


Fig.2.8 Symantec Block Diagram of Entire Project

2.5 SYSTEM OVERVIEW

Our system as User, Arduino IDE, C++ this section, we will explain briefly about each component's role to make the system function.

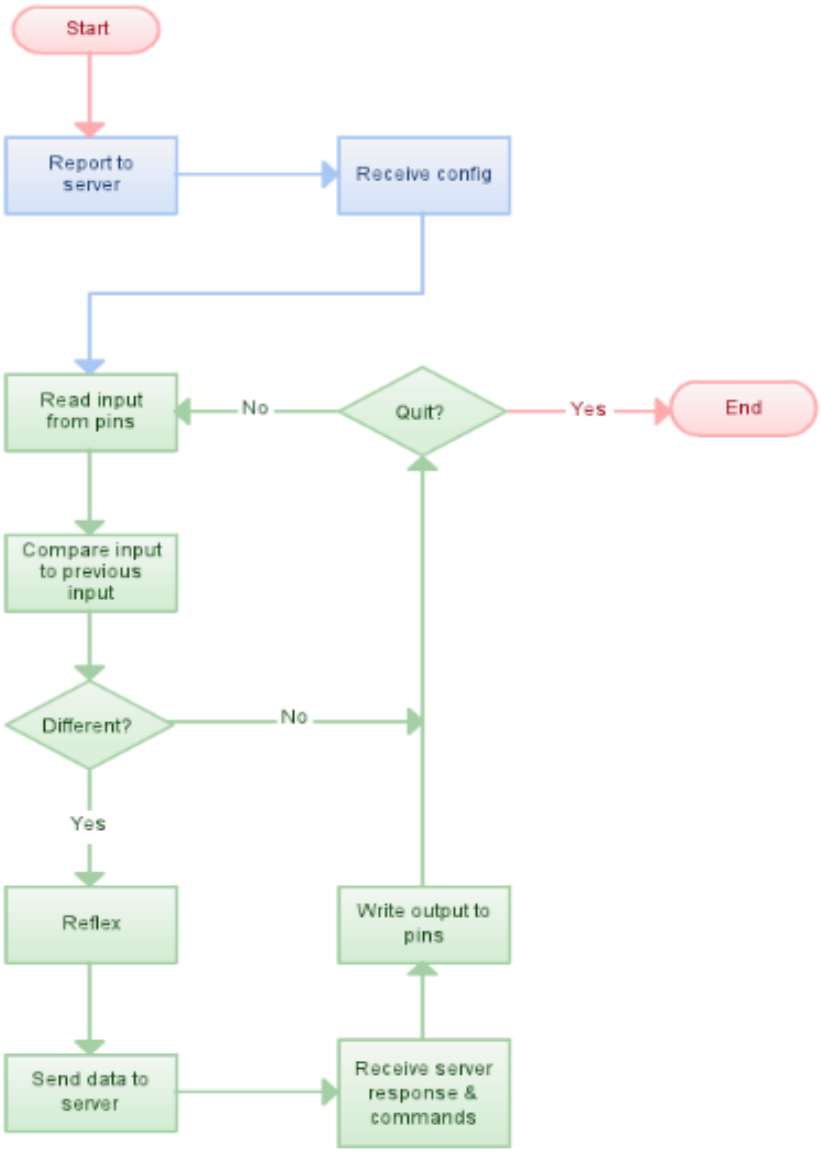


Fig.2.9 System overview

2.6 Arduino Board Mega 2560

It is a microcontroller board based on AT mega 2560 microcontroller. Arduino Boards have revitalized the automation industry with their easy to use platform where everyone with little or no technical background can get started with learning some basic skills to program and run the board.

I have updated articles previously on Arduino Uno, Arduino Nano, and Arduino Pro Mini. All these boards function similarly in one way or the other. There are some basic features like PCB layout design, size, number of analogy pins and breadboard ffriendly nature that make them different from each other

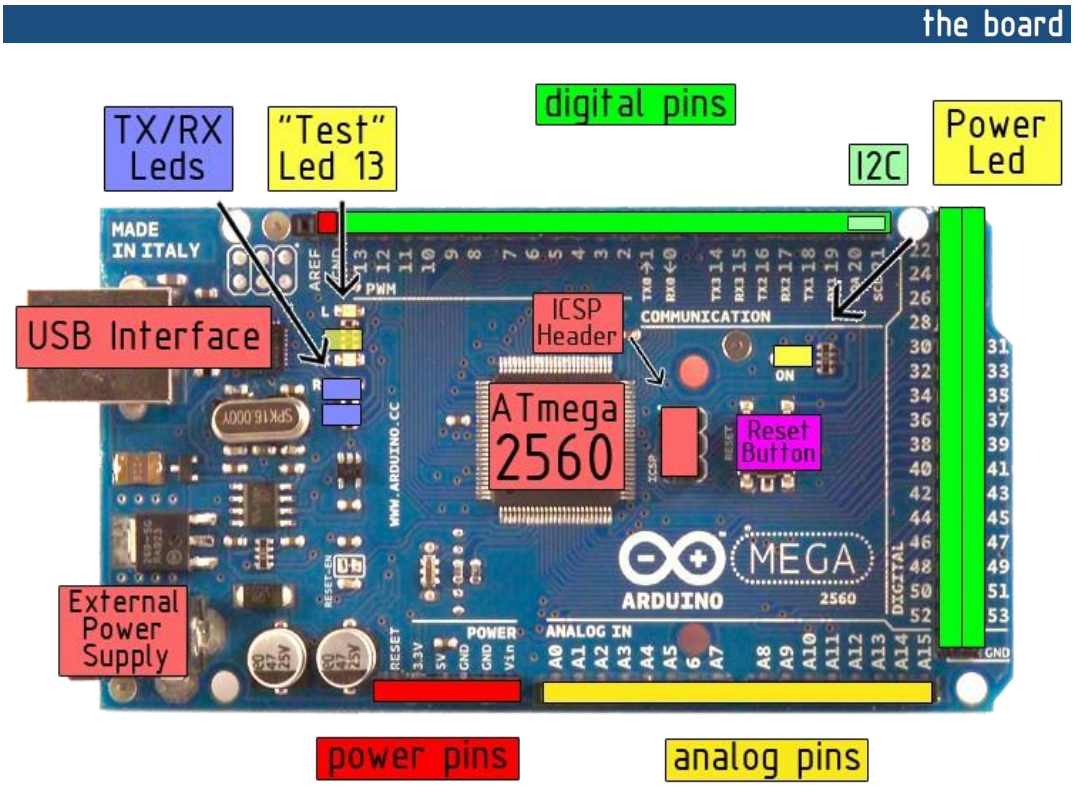


Fig. 2.10 Arduino Board Mega 256

. In terms of coding, all these boards are programmed in Arduino IDE software and you don't need to attach extra components or devices to put them in the running condition.

CHAPTER-3
SOFTWARE DESCRIPTION

3.1 GETTING STARTED – INSTALLING ARDUINO SOFTWARE

This tutorial will walk you through downloading, installing, and testing the Arduino software available at Arduino.cc (click on the Download link near the top of the page. This program is known as the Arduino IDE - short for Integrated Development Environment.

Before you jump to the page for your operating system, make sure you've got all the right equipment. The programming environment outlined in this document is provided by Arduino.cc free of charge and is the recommended programming environment for your DuinoKit.

What you will need:

- A computer (Windows, Mac, or Linux)
- An Arduino-compatible microcontroller (DuinoKits use Arduino NANO w/ ATmega328 chip)
- A USB cable is required to connect the NANO microprocessor to your computer for programming

Fig.USB cable

SUGGESTED READING

If you're new to Arduino in general, it is easy to find many tutorials and code to get you started along with the example code included in the Arduino software and the DuinoKit.com "Show and Tell" forum. Don't be afraid to Google "Arduino_____" and look through the results. There is a lot of good information available with online resources.

WINDOWS 8, 7, VISTA, AND XP

- Go to the Arduino download page and download the latest version of the Arduino software for Windows.

- When the download is finished, un-zip it and open up the Arduino folder to confirm that yes, there are indeed some files and sub-folders inside. The file structure is important so don't be moving any files around unless you really know what you're doing.
- Power up your Arduino by connecting your Arduino board to your computer with a USB cable (or FTDI connector if you're using an Arduino pro). You should see the an LED labed 'ON' light up. (this diagram shows the placement of the power LED on the UNO).
- If you're running Windows 8, you'll need to disable driver signing, so go see the Windows 8 section. If you're running Windows 7, Vista, or XP, you'll need to install some drivers, so head to the Windows 7, Vista, and XP section down below.

WINDOWS 8

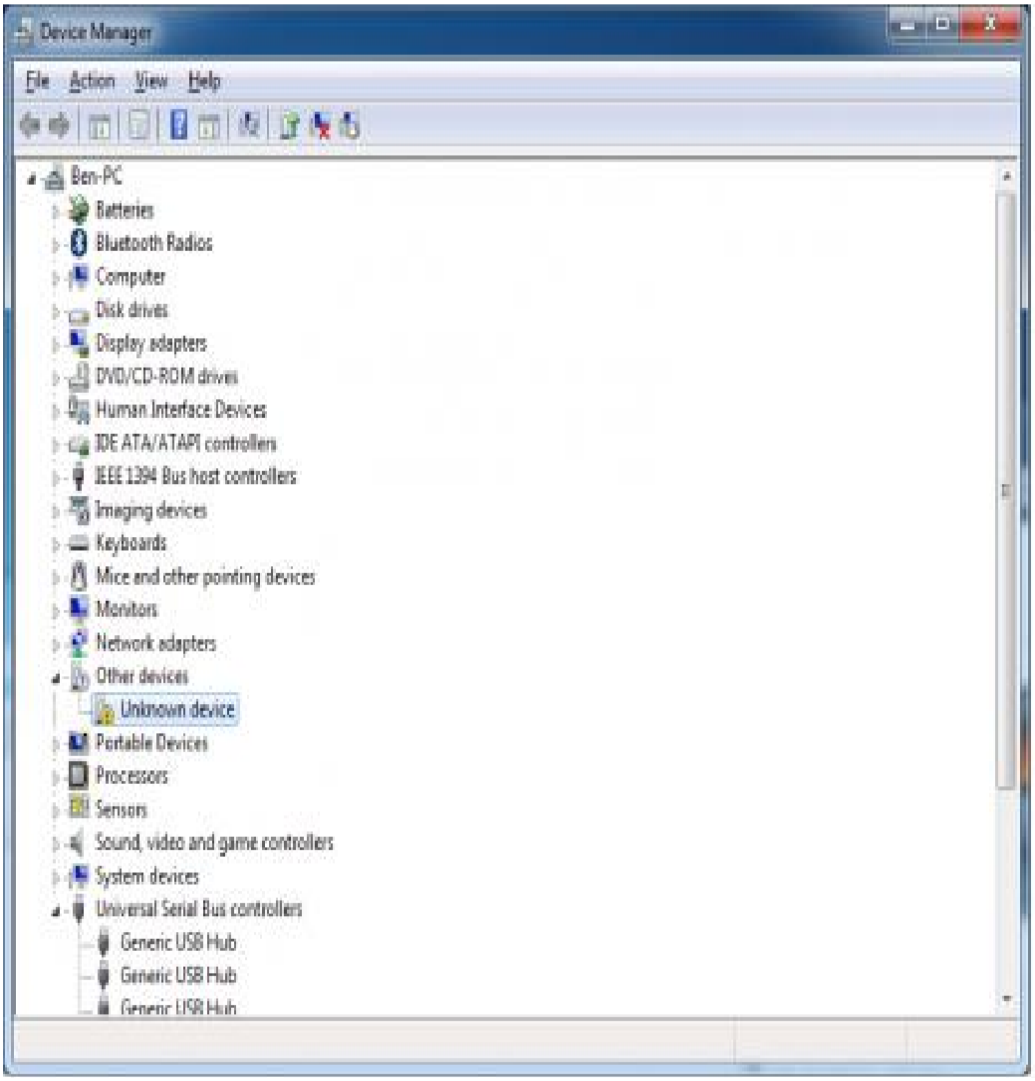
Windows 8 comes with a nice little security 'feature' that 'protects' you from unsigned driver installation. The Arduino Uno (but NOT the SparkFun RedBoard) comes with unsigned drivers, so in order to use your Uno, you'll have to tell Windows to disable driver signing.

TO TEMPORARILY DISABLE DRIVER SIGNING:

- From the Metro Start Screen, open Settings (move your mouse to the bottom-right-corner of the screen and wait for the pop-out bar to appear, then click the Gear icon)
- Click 'More PC Settings'
- Click 'General'
- Scroll down, and click 'Restart now' under 'Advanced startup'.
- Wait a bit.
- Click 'Troubleshoot'.
- Click 'Advanced Options'
- Click 'Windows Startup Settings' • Click Restart.
- When your computer restarts, select 'Disable driver signature enforcement' from the list.

WINDOWS 7, VISTA, AND XP

Installing the Drivers for the Arduino NANO w/ ATmega328 (from Arduino.cc)



- Plug in your board and wait for Windows to begin it's driver installation process
- After a few moments, the process will fail, despite its best efforts
- Click on the Start Menu, and open up the Control Panel
- While in the Control Panel, navigate to
  System and Security. Next, click on System
- Once the System window is up, open the Device Manager

- Look under Ports (COM & LPT). You should see an open port named "Arduino UNO (COMxx)". If there is no COM &

LPT section, look under ‘Other Devices’ for
‘Unknown Device’

- Right click on the “Arduino... (COMxx)” or “Unknown Device” port and choose the “Update Driver Software” option
- Next, choose the “Browse my computer for Driver software” option

- Finally, navigate to and select the “Drivers” folder of the Arduino Software download.

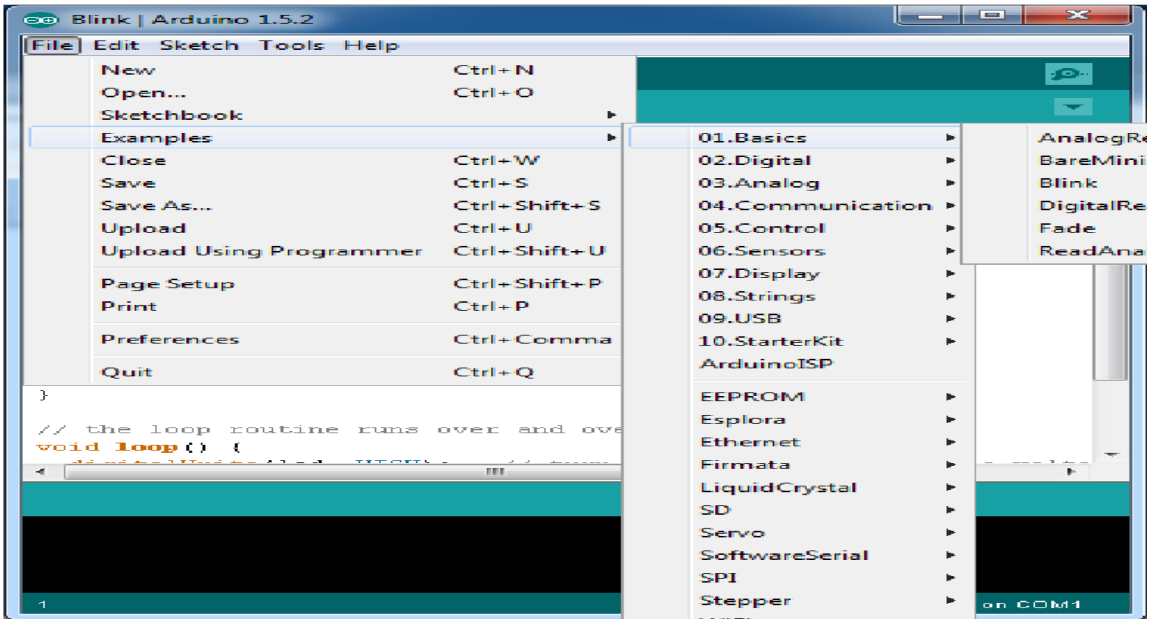
You can select the ‘drivers’ folder with the ‘search sub-folders’ option selected.

- Windows will finish up the driver installation from there.
- NOTE (On some systems you may need to “install” additional drivers).

Check again in the Device Manager and look for and repeat the above step if necessary.

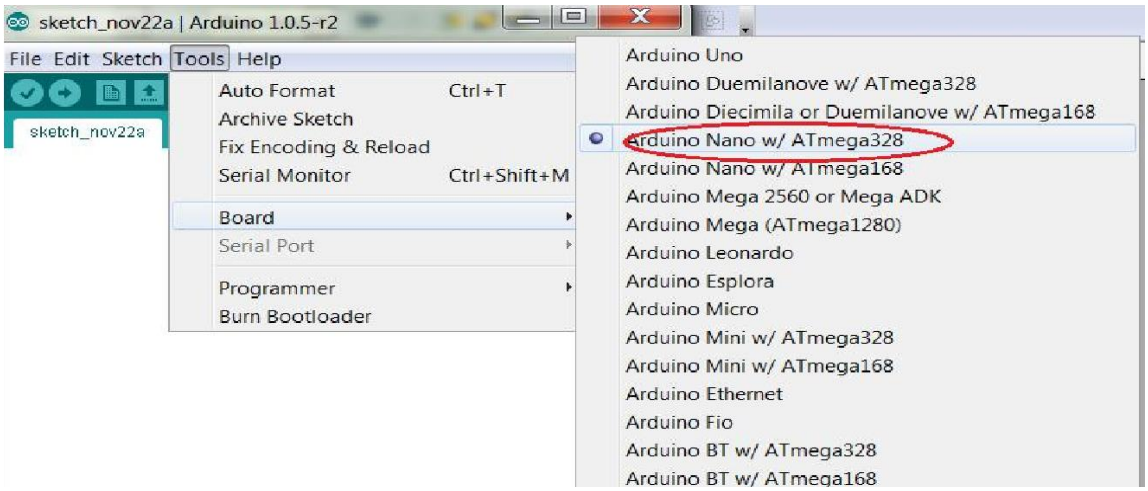
Launch and Blink!

After following the appropriate steps for your software install, we are now ready to test your first program with your Arduino board!



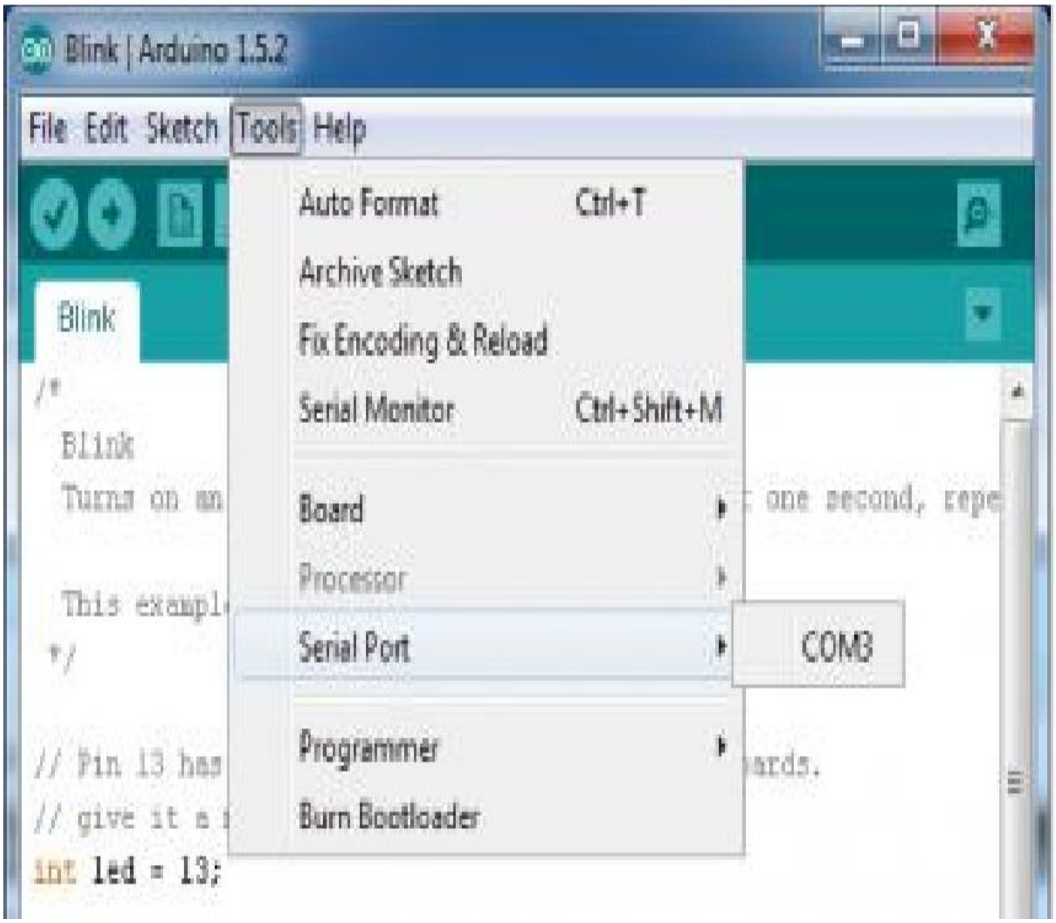
- Launch the Arduino application If you disconnected your board, plug it back in Open the Blink example sketch by going to: File Examples > 1.Basics > Blink

- Select the type of Arduino board you're using: Tools Board > NANO w/ ATmega328



- Select the Serial/COM port that your Arduino is If you're not sure which serial device is your attached to: Tools > Serial Port > COMxx Arduino, take a look at the available ports, then unplug your Arduino and look again. The one hat disappeared is your Arduino.

- With your Arduino board connected, and the Blink sketch open, press the 'Upload' button



- After a second, you should see some LEDs flashing on your Arduino, followed by the message 'Done Uploading' in the status bar of the Blink sketch.
- If everything worked, the onboard LED on your Arduino should now be blinking! You just programmed your first Arduino!
- Can you look through the "Blink" code and find/change setting for the timing of the LED?

Now move onto "Show and Tell" section of the DuinoKit.com website for additional instructions and program examples. There is also a HUGE collection of programs, examples and tutorials avilable online with just a little searching.

TROUBLESHOOTING

If you are having trouble, please search for information or tutorials online. We also offer the "Show and Tell" forum for DuinoKit users. Since the Arduino is a open-source microporcessor there are countless examples and and tutorials available.

MAC USERS

This page will show you how to install and test the Arduino software on a Mac computer running OSX.

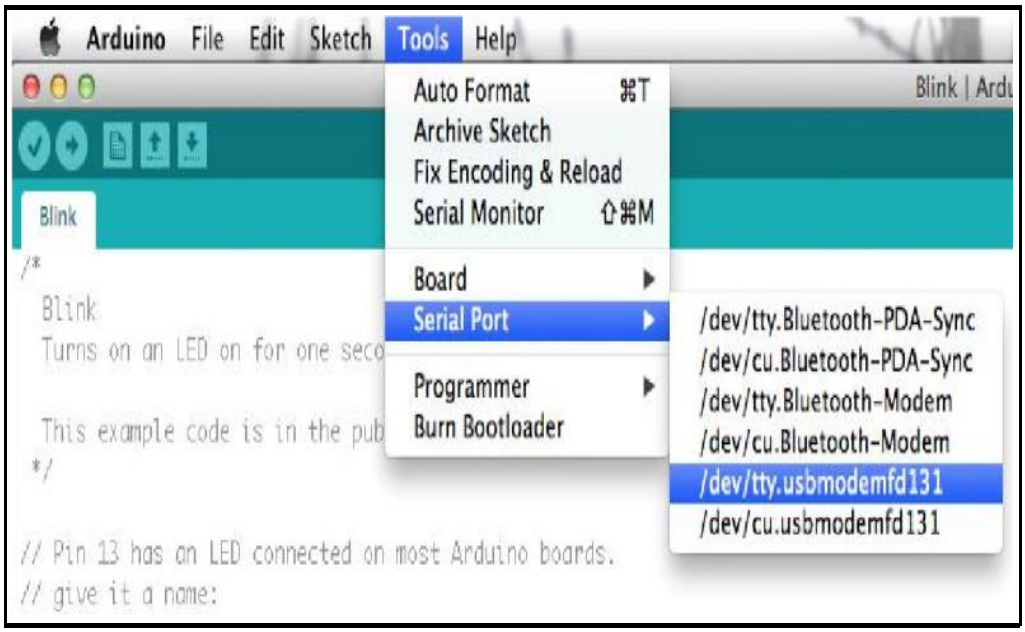
- Go to the Arduino download page and download the latest version of the Arduino software for Mac.
- When the download is finished, un-zip it and open up the Arduino folder to confirm that yes, there are indeed some files and sub-folders inside. The file structure is important so don't be moving any files around unless you really know what you're doing.
- Power up your Arduino by connecting your Arduino board to your computer with a USB cable (or FTDI connector if you're using an Arduino pro). You should see the an LED labed 'ON' light up. (this diagram shows the placement of the power LED on the UNO).
- Move the Arduino application into your Applications folder.

FTDI DRIVERS

If you have an UNO, Mega2560, or Redboard, you shouldn't need this step, so skip it!

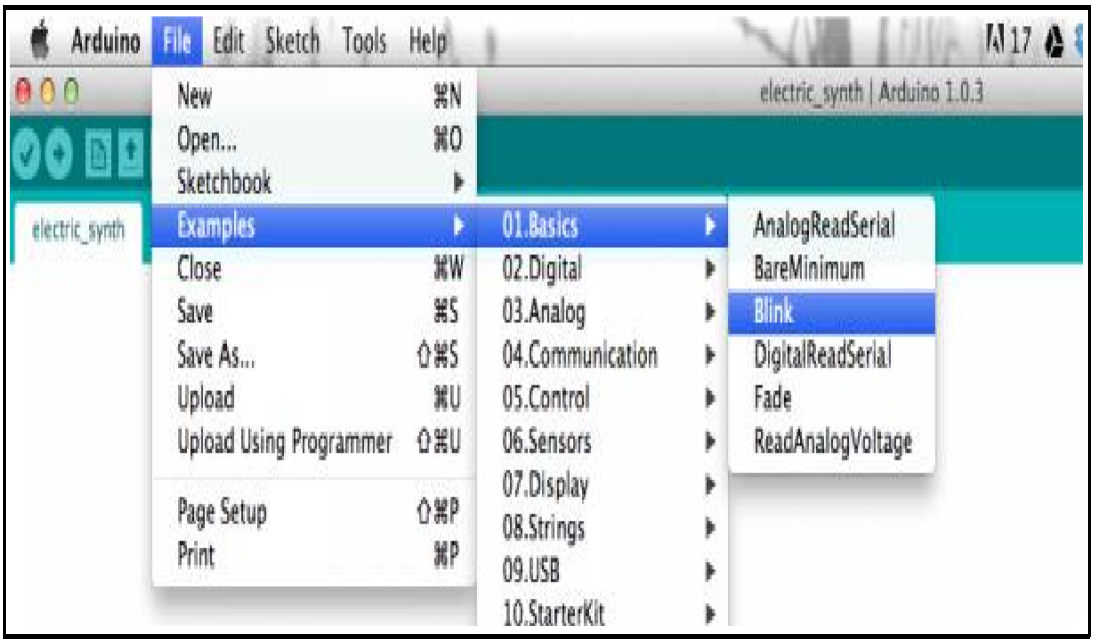
- For other boards, you will need to install drivers for the FTDI chip on your Arduino.

- Go to the FTDI website and download the latest version of the drivers.
- Once you're done downloading, double click the package and follow the instructions from the installer.
- Restart your computer after installing the drivers.



LAUNCH AND BLINK!

After following the appropriate steps for your software install, we are now ready to test your first program with your Arduino board!



- Launch the Arduino application
- If you disconnected your board, plug it back in
- Open the Blink example sketch by going to: File > Examples > Basics > Blink

- Select the type of Arduino board you're using: Tools > Board > NANO w/ ATmega328
- Select the serial port that your Arduino is attached to: Tools > Port > xxxxxx (it'll probably look something like "/dev/tty.usbmodemfd131" or "/dev/tty.usbserial-131" but probably with a different number)
- If you're not sure which serial device is your Arduino, take a look at the available ports, then unplug your Arduino and look again. The one that disappeared is your Arduino.
- With your Arduino board connected and the Blink sketch open, press the 'Upload' button
- After a second, you should see some LEDs flashing on your Arduino, followed by the message 'Done Uploading' in the status bar of the Blink sketch.
- If everything worked, the onboard LED on your Arduino should now be blinking! You just programmed your first Arduino!
- Can you look through the "Blink" code and find/change setting for the timing of the LED?

Now move onto "Show and Tell" section of the DuinoKit.com website for additional instructions and program examples. There is also a HUGE collection of programs, examples and tutorials avilable online with just a little searching.

CHAPTER - 4

RESULTS

4.1 PHYSICAL STRUCTURE OF TRANSFORMER FAILURE DETECTION

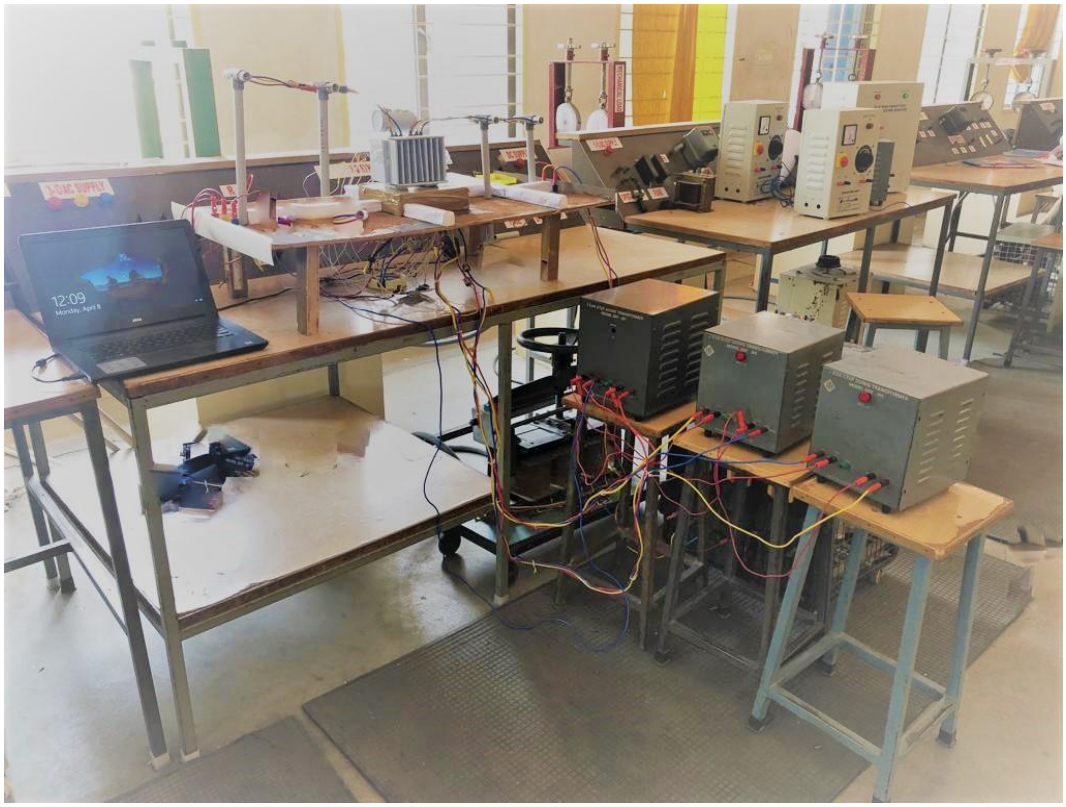


Fig. 4.1 Physical Structure of Transformer Failure Detection

The above figure shows all physical connection L.T (Low Terminals) and H.T (High Terminal) connected in a delta and star fashion. At L.T side we connecting 2KVA step down transformers and at H.T side to represent the load of a motor we replacing with resistive load of 12 Amps.

On the conservative tank we have Gas Sensor, Temperature Sensor, Ultrasonic Sensor; which are mounted on Cylinder.

4.2 OCCURRENCE OF B-PHASE LT FAULT ON TRANSFORMER

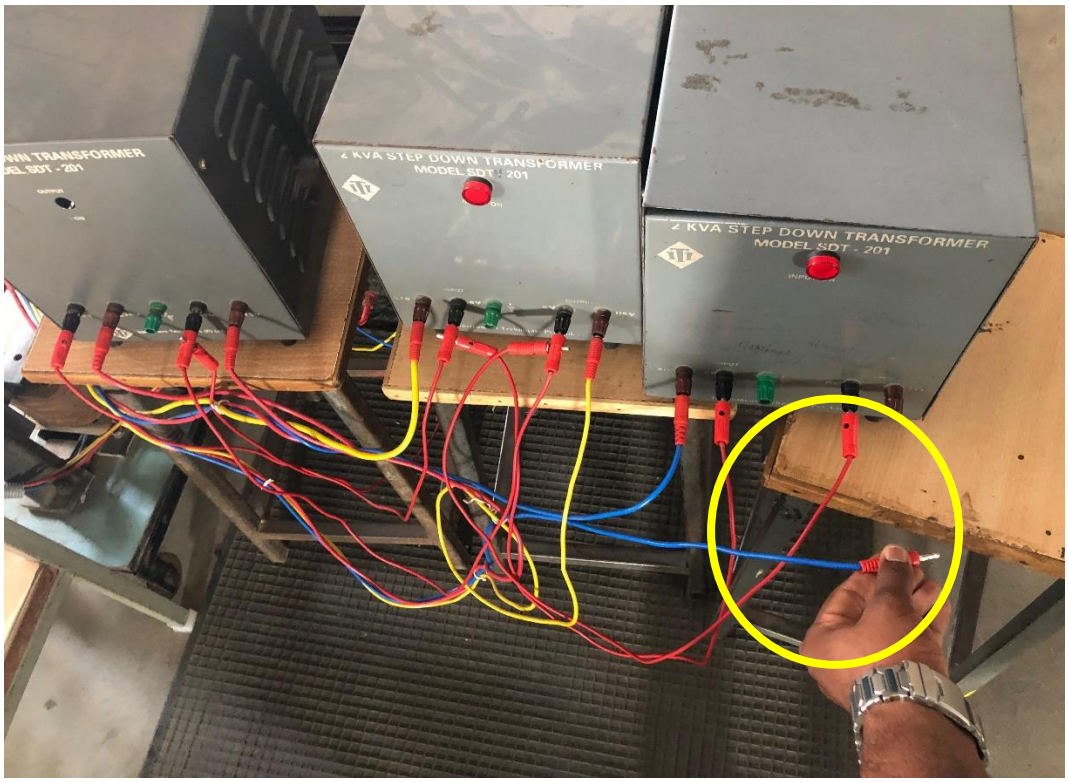


Fig. 4.2 Occurrence Of B-Phase Lt Fault On Transformer

4.3 MESSAGE DISPLAYING ON CELLULAR DEVICE FOR THE RELEVANT FAULT TO THE LINE MAN

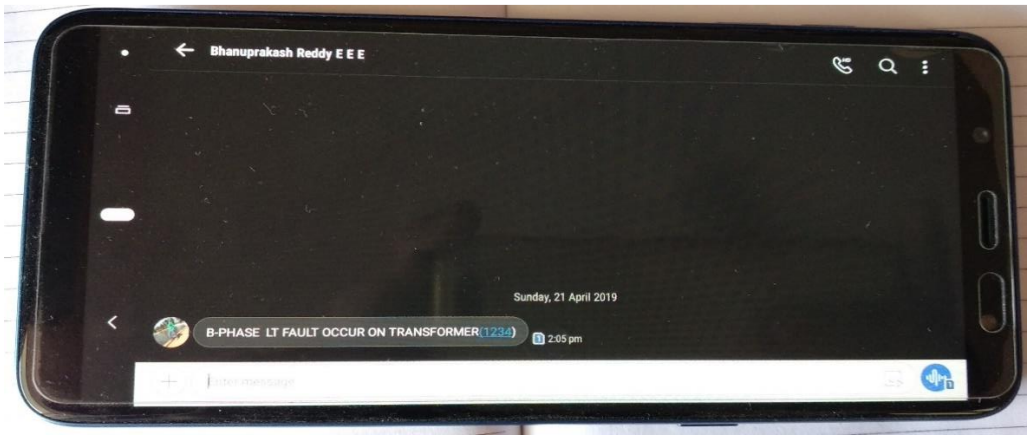


Fig. 4..3 Message Displaying On Cellular Device For The Relevant Fault To The Line Man

4.4 OCCURRENCE OF B-PHASE HT FAULT ON TRANSFORMER

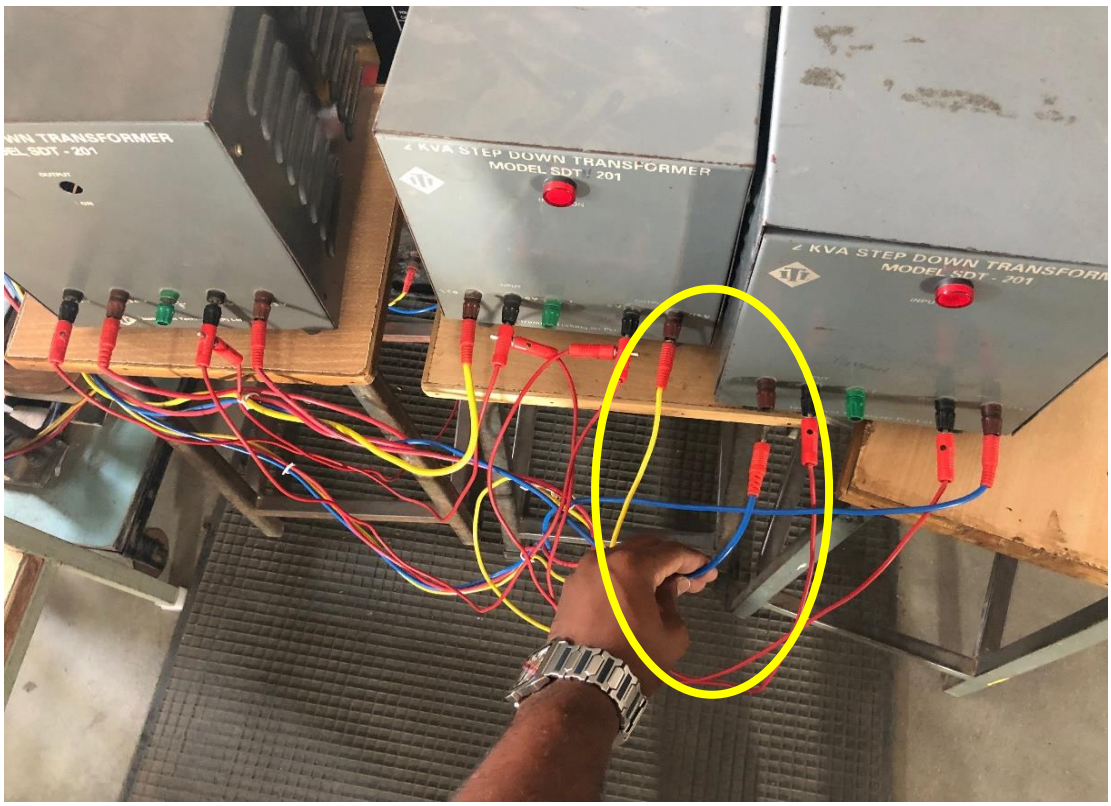


Fig. 4.4 Occurrence Of B-Phase Ht Fault On Transformer

4.5 MESSAGE DISPLAYING ON CELLULAR DEVICE FOR THE RELEVANT FAULT TO THE LINE MAN

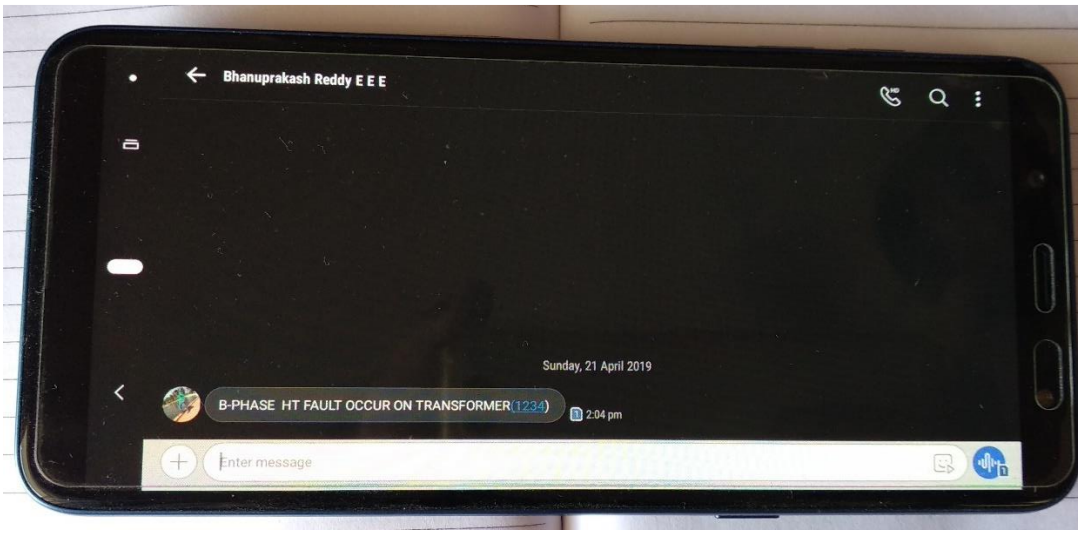


Fig. 4.5 Message Displaying On Cellular Device For The Relevant Fault To The Line Man

4.6 OCCURRENCE OF Y-PHASE LT FAULT ON TRANSFORMER

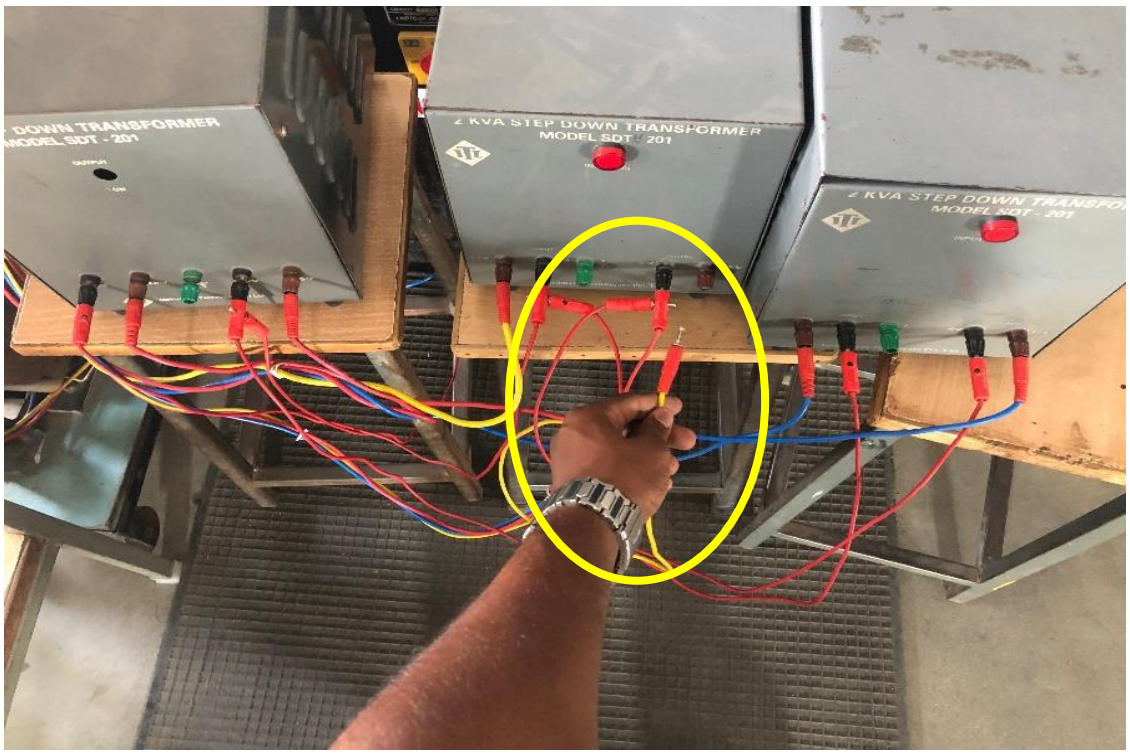


*Fig. 4.**6** Occurrence Of Y-Phase Lt Fault On Transformer*

4.7 MESSAGE DISPLAYING ON CELLULAR DEVICE FOR THE RELEVENT FAULT TO THE LINE MAN

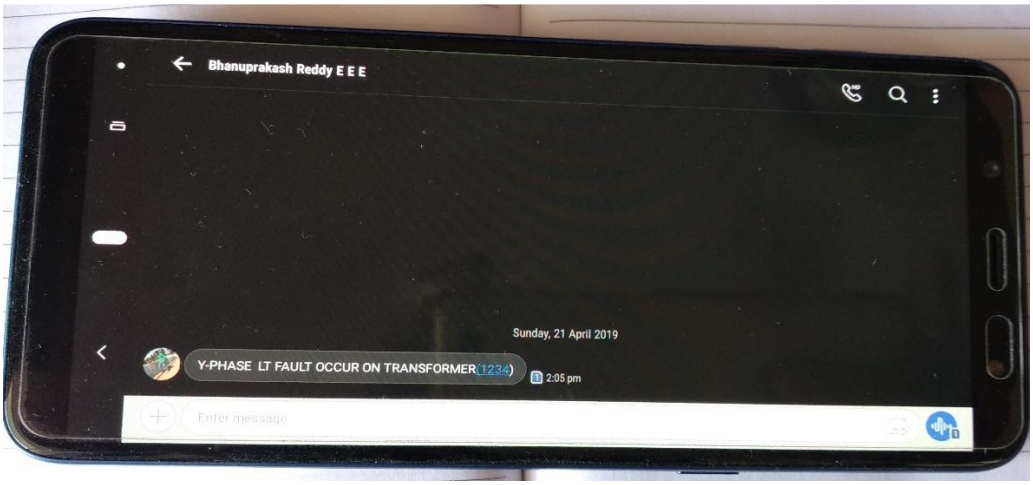


Fig. 4.7 Message Displaying On Cellular Device For The Relevant Fault To The Line Man

4.8 OCCURRENCE OF Y-PHASE HT FAULT ON TRANSFORMER

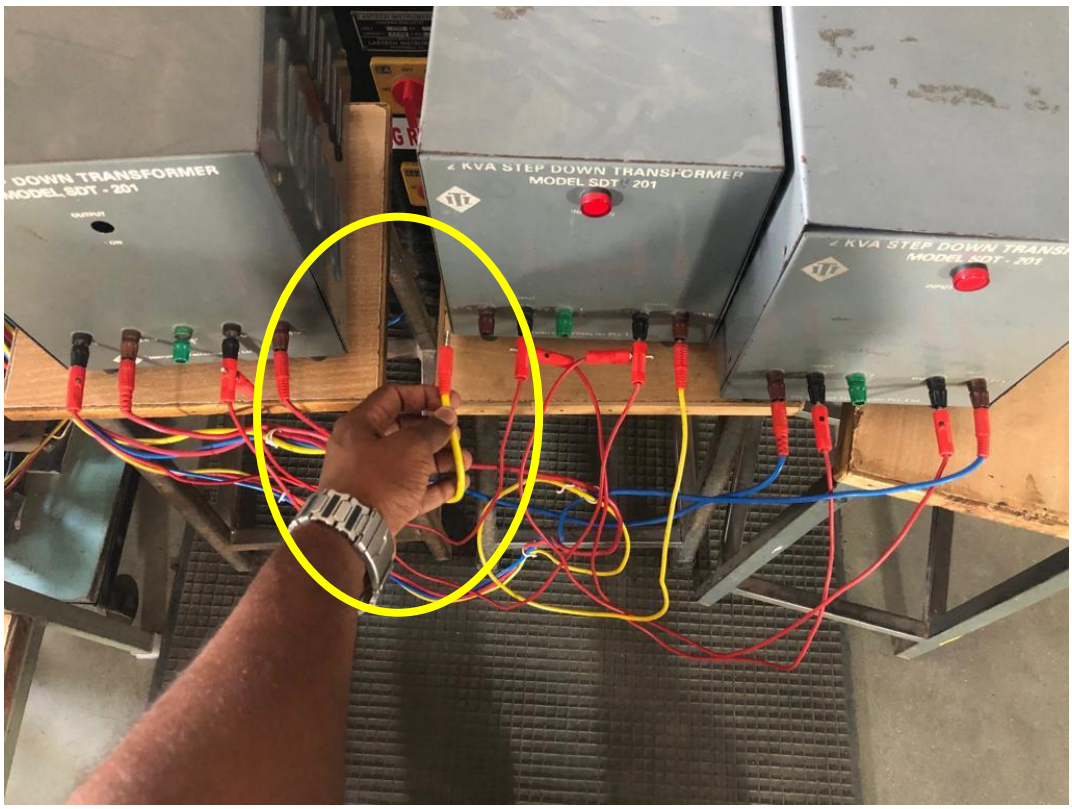


Fig. 4.8 occurrence Of Y-Phase Ht Fault On Transformer

.4.9 MESSAGE DISPLAYING ON CELLULAR DEVICE FOR THE RELEVENT FAULT TO THE LINE MAN

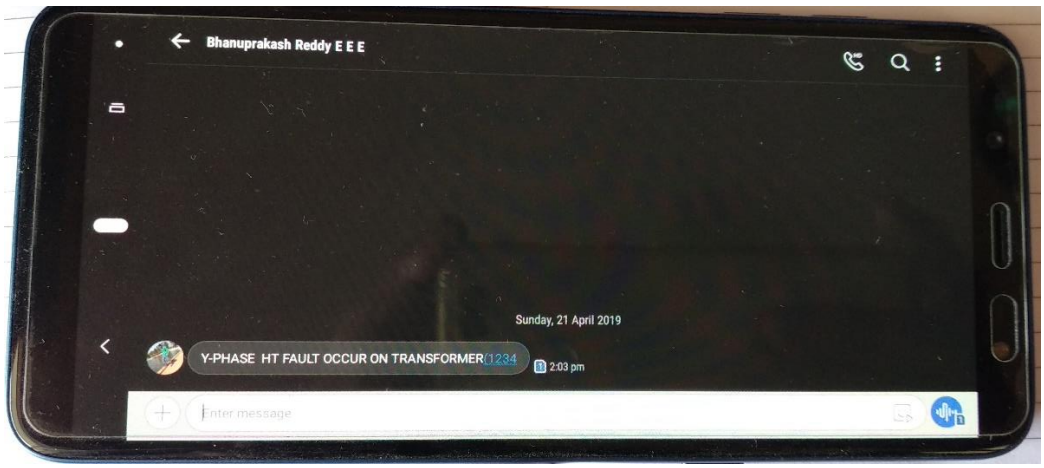


Fig. 4.9 Message Displaying On Cellular Device For The Relevant Fault To The Line Man

4.10 OCCURRENCE OF R-PHASE LT FAULT ON TRANSFORMER

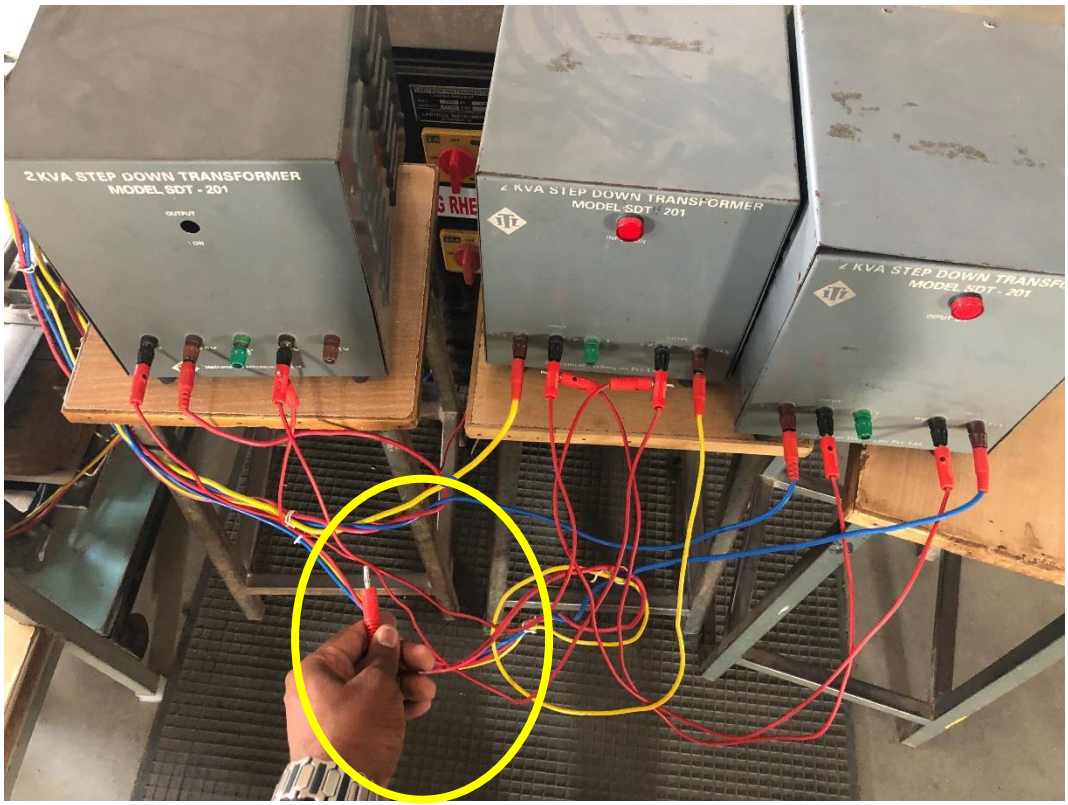


*Fig. 4.***10** *Occurrence Of R-Phase Lt Fault On Transformer*

.4.11 MESSAGE DISPLAYING ON CELLULAR DEVICE FOR THE RELEVENT FAULT TO THE LINE MAN

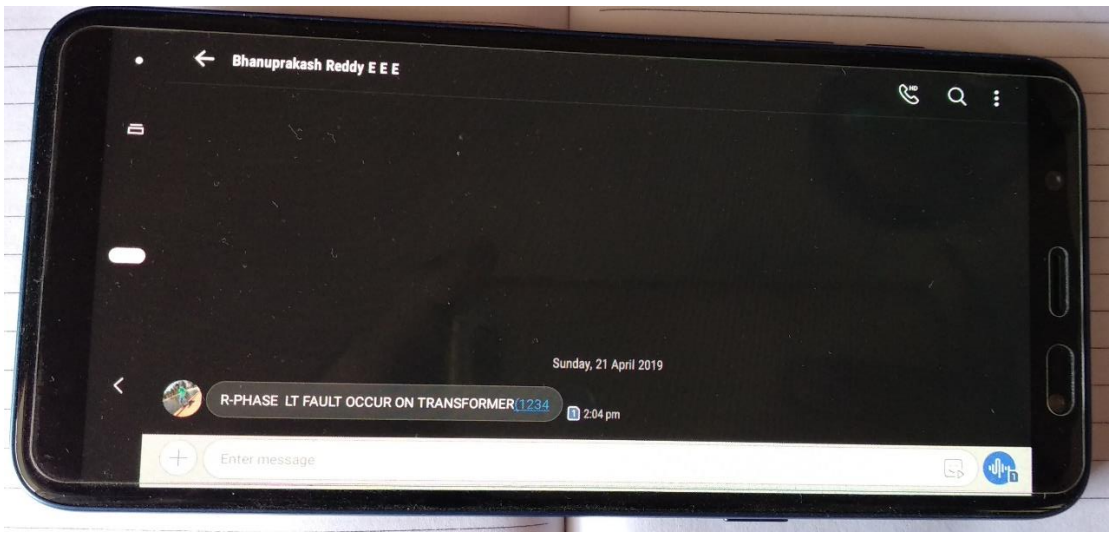


Fig. 4.11 Message Displaying On Cellular Device For The Relevant Fault To The Line Man

4.12 OCCURRENCE OF R-PHASE HT FAULT ON TRANSFORER

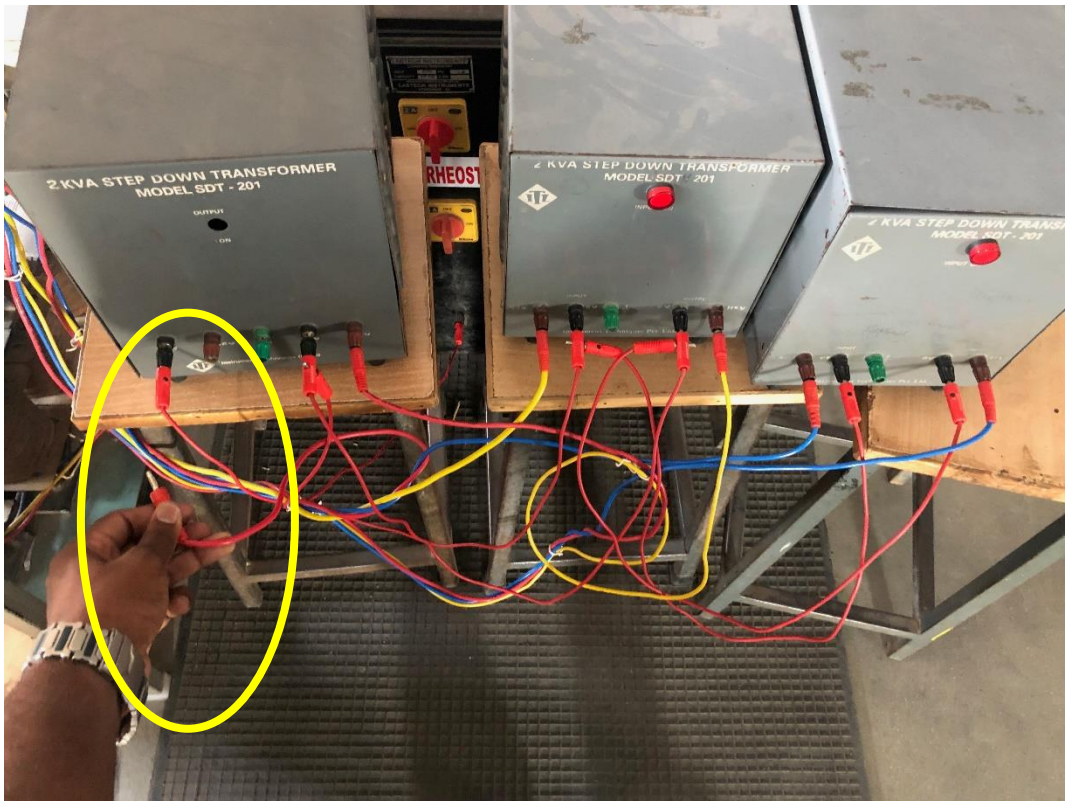


Fig. 4.12 Occurrence Of R-Phase HT Fault On Transformer

.

4.13 MESSAGE DISPLAYING ON CELLULAR DEVICE FOR THE RELEVENT FAULT TO THE LINE MAN

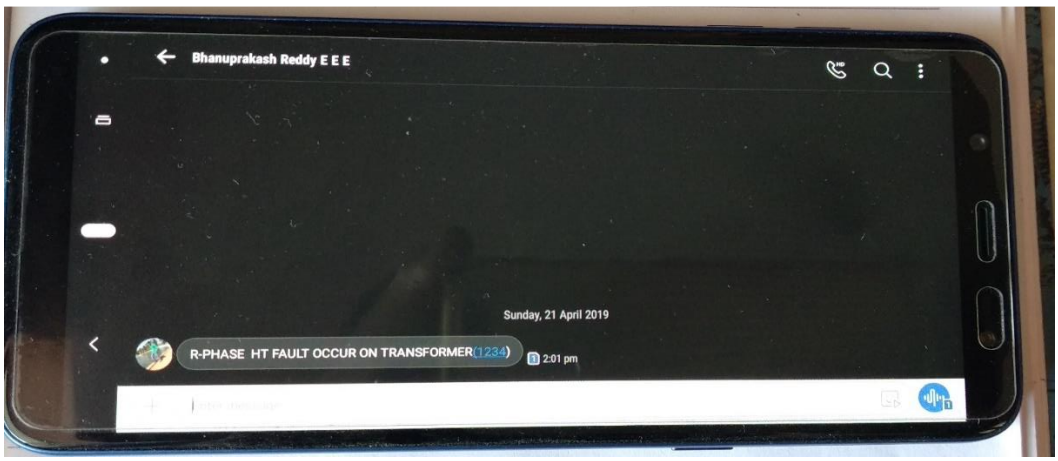


Fig. 4.13 Message Displaying On Cellular Device For The Relevant Fault To The Line Man

4.14 OCCURRENCE OF INCREASING IN TEMPERATURE MAKING TRANSFORMER BURST

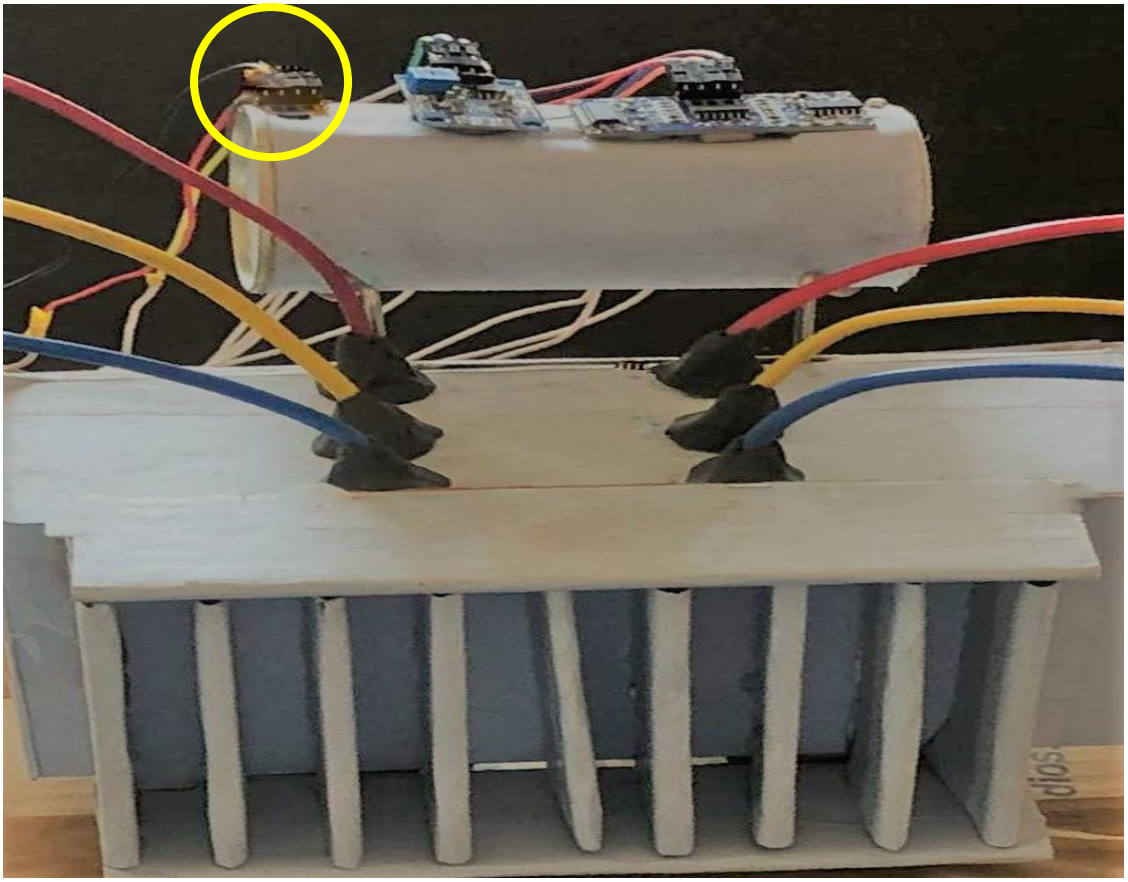


Fig. 4.14 Occurrence Of Increasing In Temperature Making Transformer Burst

4.15 MESSAGE DISPLAYING ON CELLULAR DEVICE FOR THE RELEVANT FAULT TO THE LINE MAN

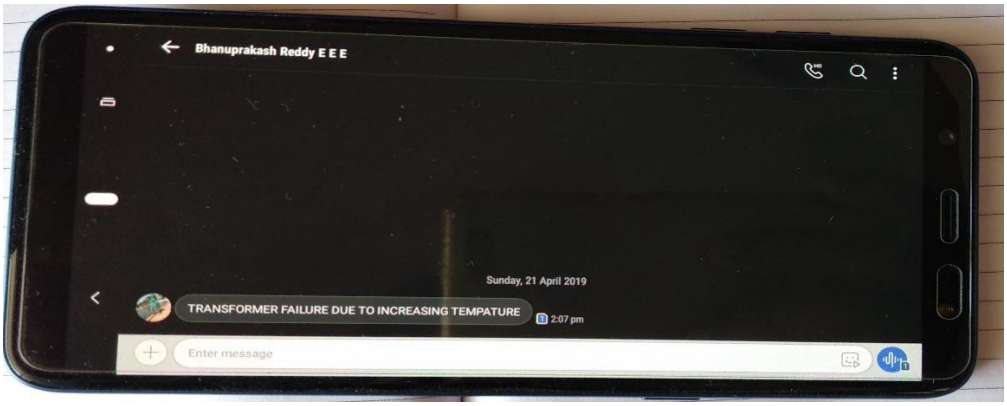


Fig. 4.15 Message Displaying On Cellular Device For The Relevant Fault To The Line Man

4.16 DECREASING IN OIL LEVEL IN THE CYLINDER

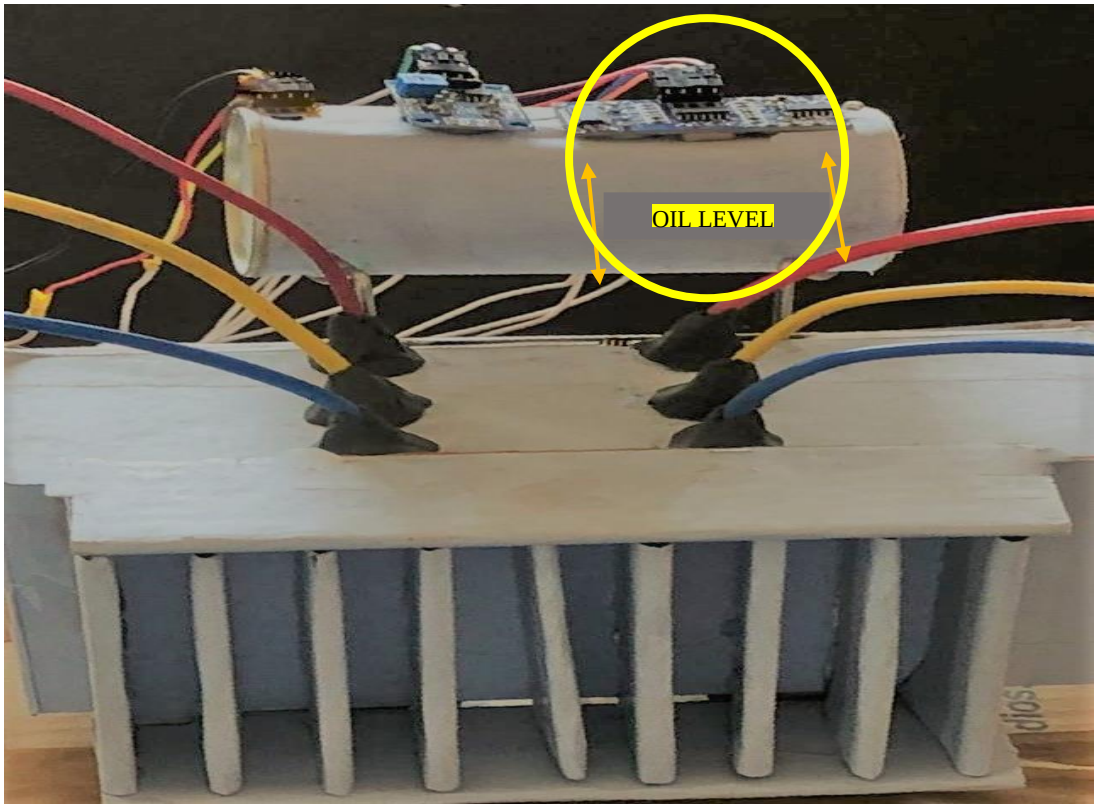


Fig. 4.16 Decreasing In Oil Level In The Cylinder

4.17 MESSAGE DISPLAYING ON CELLULAR DEVICE FOR THE RELEVANT FAULT TO THE LINE MAN

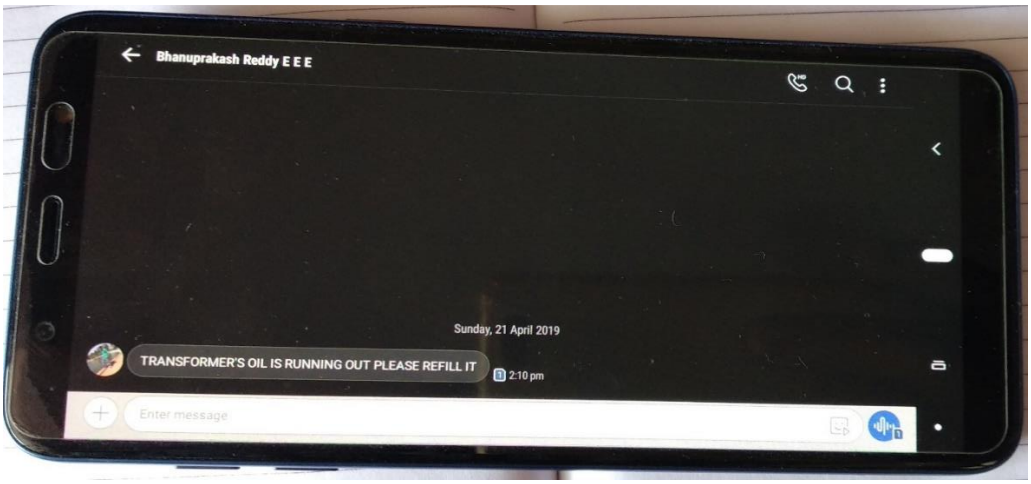


Fig. 4.17 Message Displaying On Cellular Device For The Relevant Fault To The Line Man

4.18 LEAKAGE OF GASES IN THE CYLINDER DUE TO LEAKAGES

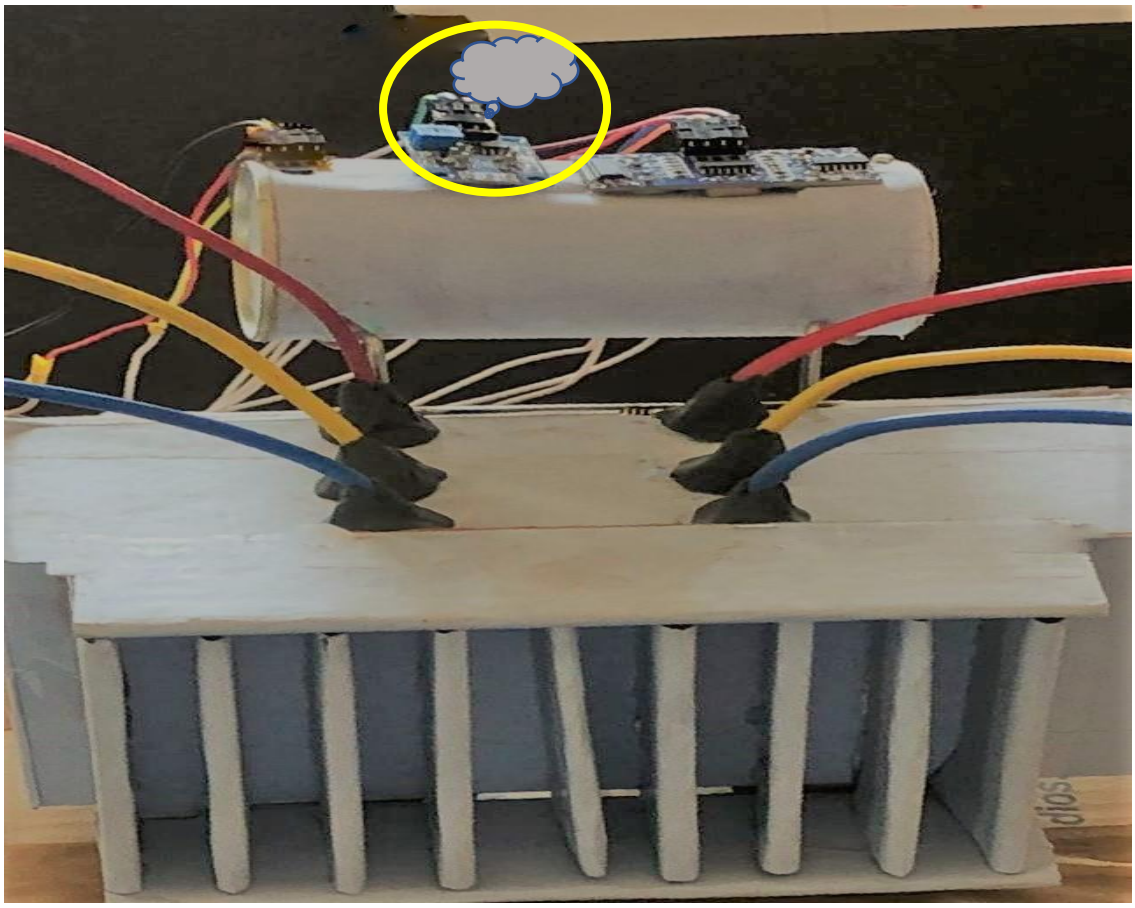


Fig. 4.18 Leakage Of Gases In The Cylinder Due To Leakages

4.19 MESSAGE DISPLAYING ON CELLULAR DEVICE FOR THE RELEVANT FAULT TO THE LINE MAN

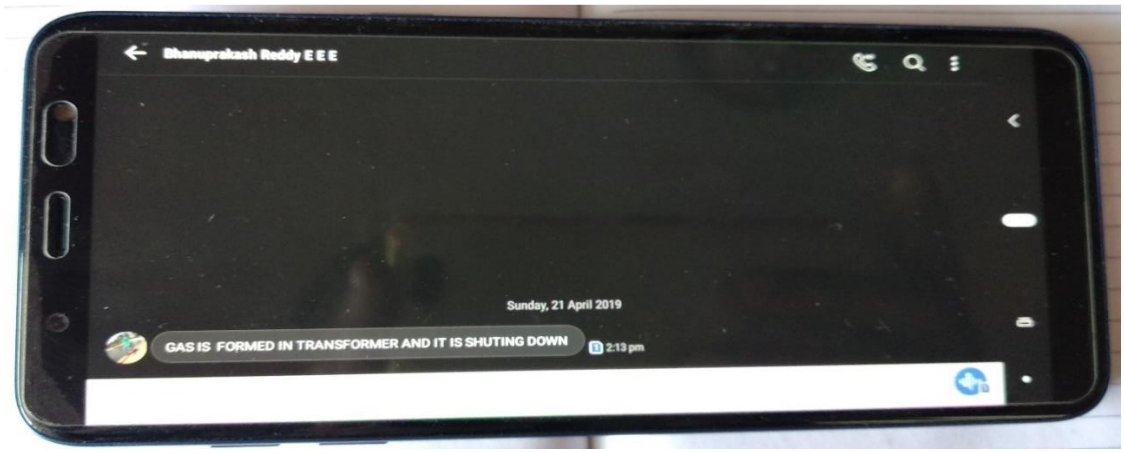


Fig. 4.19 Message Displaying On Cellular Device For The Relevant Fault To The Line Man

4.20 OCCURENCE OF 3-PHASE FAULT ON TRANSFORMER

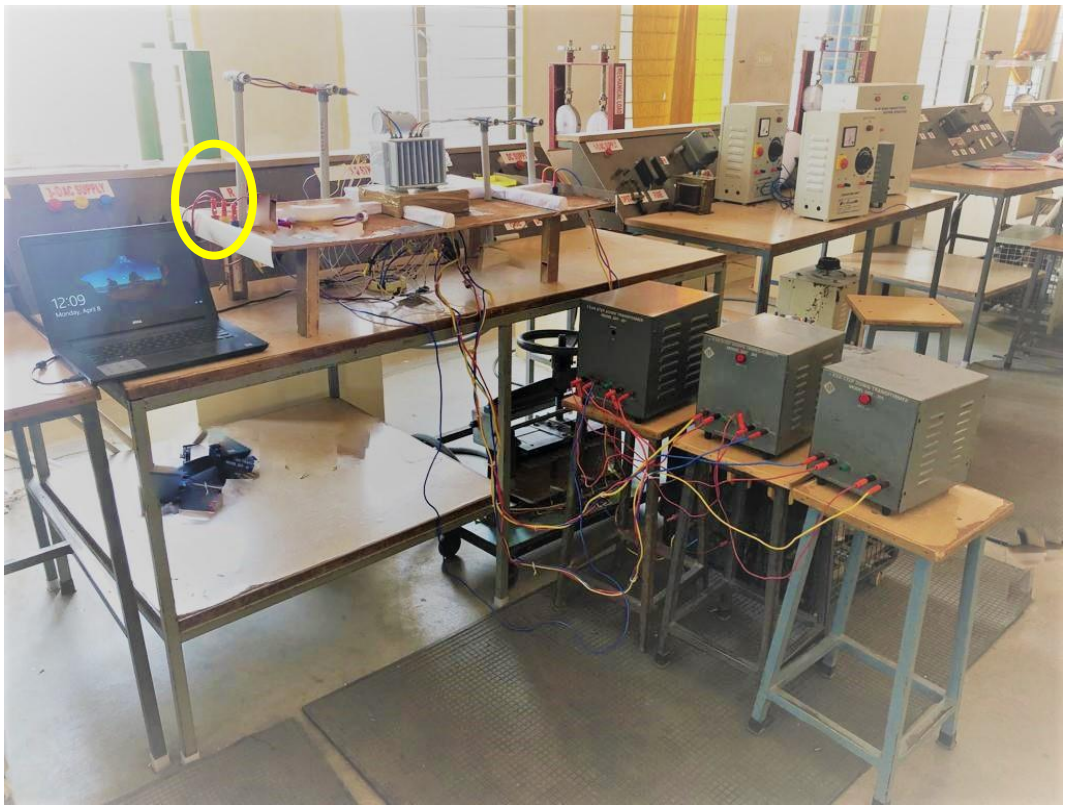


Fig. 4.20 occurrence Of 3-Phase Fault On Transformer

4.21 MESSAGE DISPLAYING ON CELLULAR DEVICE FOR THE RELEVANT FAULT TO THE LINE MAN

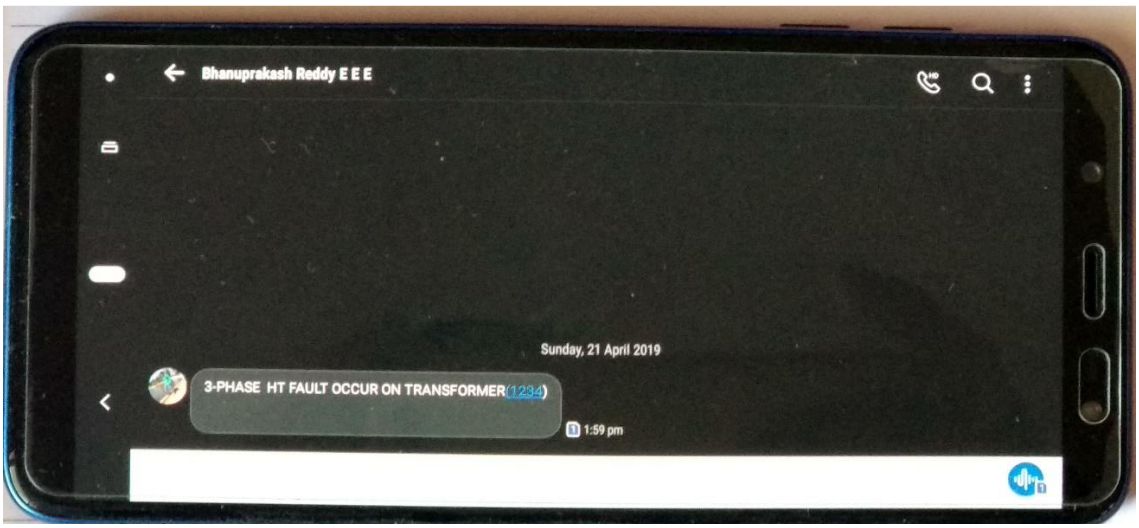


Fig. 4.21 Message Displaying On Cellular Device For The Relevant Fault To The Line Man

CHAPTER-5

CONCLUSION AND FUTURE SCOPE

As Automation as became a part an parcel of out daily life necessary electrical (or) electronics and mechanical equipment. And made out of Life easy and reliable. Our project (Transformer Failure detection and response) is one if the project that makes the transfer maintenance and monitoring easy. As transformer

Is a core part of electrical stream them its importance to make it automotive?

And easy access control and monitor. So, using this new proposed system would be worth of maintaining the transformer continues service easy and comfortable.

- **Detection of transformer faults**
- **Rresponse to ensure the consumer reliability**
- **FAULTS get corrected as soon as possible**
- **So, the economical wealth can make the sustainability of CROP PRDUCTION**.

Hoping of solving the fault can make the operation of ease and savings of economy.

CHAPTER-6

BUDGET ANALYSIS

S.NO	NAME OF THE EQUIPMENT	QUANTITY	PRICE IN RS/-
1	Arduino	1	900
2	3-phase solid state Relays	1	4000
3	GSM module	1	1530
4	Gas Sensor	1	290
5	Ultrasonic sensor	1	150
6	Temperature Sensor	1	335
7	Transformers	1	51,000
8	Resistive Load	1	22,000
9	Furniture Design	-	3800
10	Connecting Wires	-	1000
GRAND TOTAL			**85,005/-**

CHAPTER-7

BIBLIOGRAPHY

D.HARINATH REDDY	Proposal & Researcher
FAYSAL AHAMMED	Logical Programming
C.BHANU PRAKASH REDDY	Technical Hardware
J. LAKSHMI THEJA	Technical Designer & Documentation
A.G. GAGAN CHANDRA	Helper

Arduino mega2560-reference-design.zip - from www.robotshop.com

Current Sensor from www.robotshop.com

LM35 Reference design TexasInstrument.com

HCSR04 Ultrasonic Sensor Styron Technologies

MQ-9 gas sensor hanwei electronics co., ltd http://www.hwsensor.com

3-Ph Solid State Relay www.relequick.com