

# Induction Motor Controller and Protection System

## INTRODUCTION

An automatic induction motor control and protection system for industrial applications.

Induction motors need efficient control to handle industrial applications. Induction Motor Controller and Protection system controls the speed of the induction motor and protects it from high vibration and temperature. System uses a Hall Effect sensor to measure the RPM of the motor and a temperature sensor to monitor motor temperature. The sensor is used to monitor temperatures of heavy duty induction motors during operation. The sensor constantly monitors motor temperature and displays on LCD Display. As soon as the temperature rises beyond certain limit, the system turns off the motor to avoid fires or coil burning. Similarly we use a vibration sensor to monitor the motor vibrations during operation.. The vibration of motor is displayed on LCD display as it runs. If the motor vibrates beyond certain limit the system turns off the motor to avoid any damage to machine or motor so that it can be fixed in time and avoid any accidents. Thus the system provides a complete induction motor controlling as well as protection system for industrial applications. controll the induction motor through android app on our smartphone also we get live reading of speed, temperature, and vibration.

Induction motors have been used widely in different fields ranging from domestic appliances to industrial machinery. This necessitates a speed control mechanism that is efficient and is also safe to use. Also the induction motor can be run in either of the two directions which is quite useful in many applications.

But Induction motors like any other motors need efficient control to handle industrial applications. Along with it motors are the most vulnerable parts to get damaged as they product the desired motion in any machine. So we also integrate a temperature and vibration detection alert in the system.

This System provides the following advantages:

Induction Motor Switching using App

Induction Motor Speed Control

Motor Direction Control (Clockwise/Anticlockwise)

Motor Fire Protection

Motor Vibration Alert

Induction Motor Controller and Protection system serves this purpose of controlling the speed and direction of the induction motor along with protecting it from high vibration and temperature.

Induction motor runs through direct AC line the amount of power given to it decides to what RPM it does rotates.

We use an Encoder sensor to measure the RPM of the motor. Also we take the wheel size input from user so that we can calculate the distance travelled by motor.

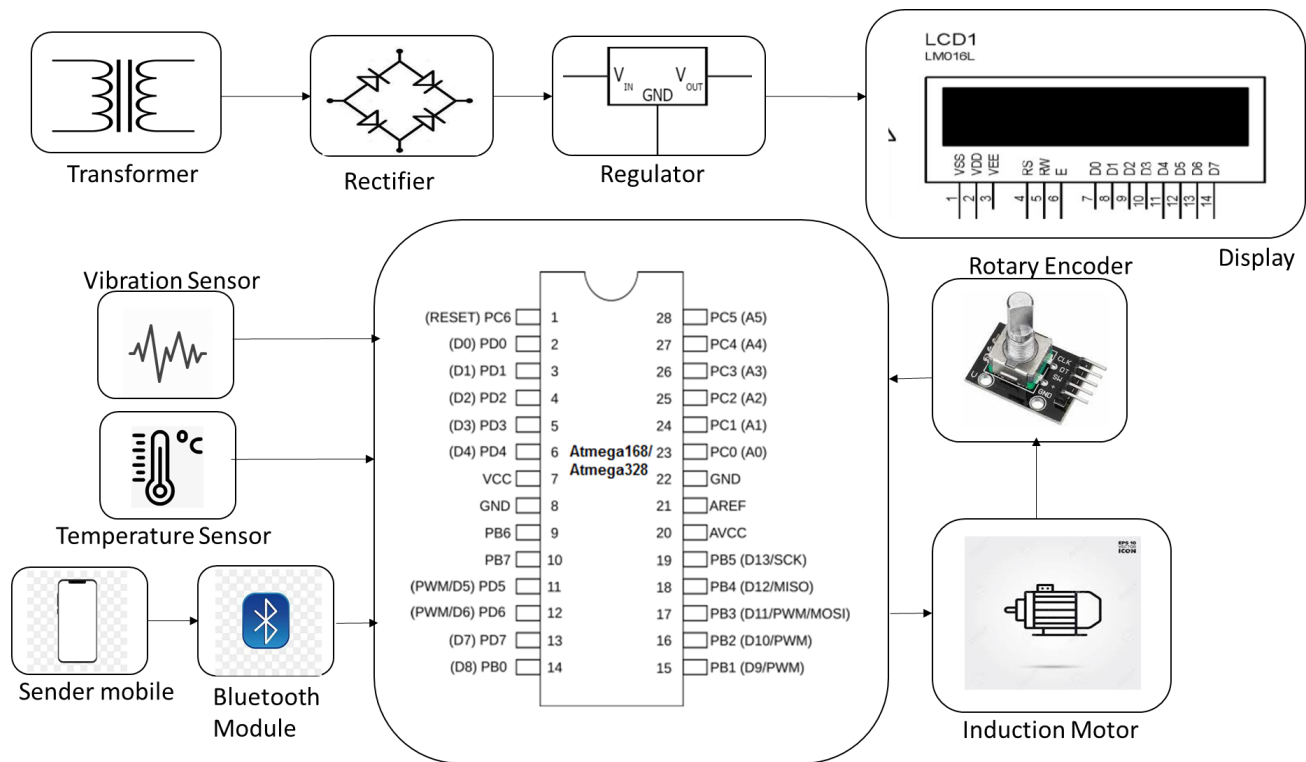
We can modulate the power of the AC line to vary the speed of the induction motor through AC driver circuitry. An Atmega family microcontroller is used to give PWM power to an opto-coupler which drives the TRIAC giving supply to the induction motor. Instructions to the microcontroller are fed through bluetooth connection to the system.

An app is used to increase the speed of the motor, a button to change direction and a button to decrease speed of the induction motor. One can observe the whole process as it happens on the LCD. In this way this project proves to be quite useful in handling an Induction Motor for its speed and direction.

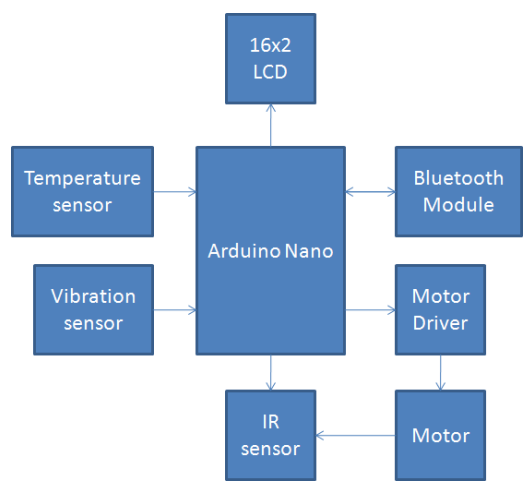
Now we use a Temperature sensor to detect induction motor temperature. The sensor is used to monitor temperatures of heavy duty induction motors during operation. The sensor constantly monitors motor temperature and displays on LCD Display. As soon as the temperature rises beyond certain limit, the system turns off the motor to avoid fires or coil burning.

Similarly we use a vibration sensor to monitor the motor vibrations during operation. The vibration of motor is displayed on LCD display as it runs. If the motor vibrates beyond a certain limit the system turns off the motor to avoid any damage to machine or motor so that it can be fixed in time and avoid any accidents.

Thus the system provides a complete induction motor controlling as well as protection system for industrial applications.



Block diagram:



Explanation:

Arduino Nano is used as main controlling board in this system. All the sensors, controlling components are connected to Arduino nano.

Temperature sensor is used to measure temperature of motor. Its output is connected to Arduino.

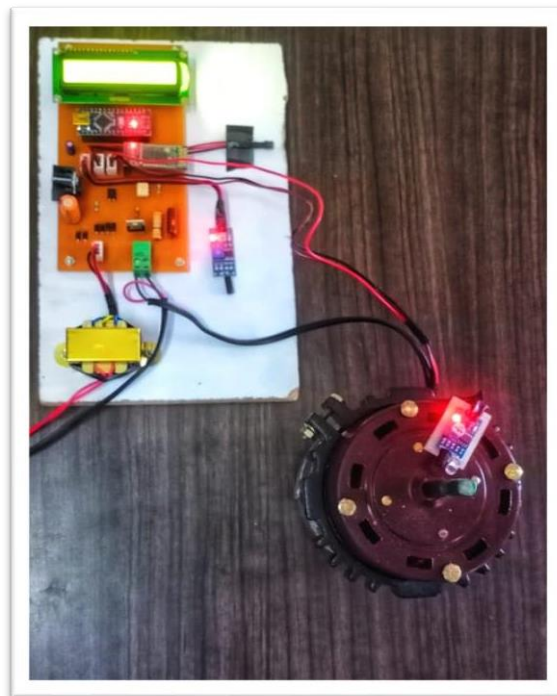
Vibration sensor is used to measure vibrations in the motor. Its output is connected to arduino.

The IR sensor is used to measure the Rotation of the shaft of the motor. Its output is connected to Arduino.

Bluetooth module is used to connect the system with Android app which is in the smart phone.

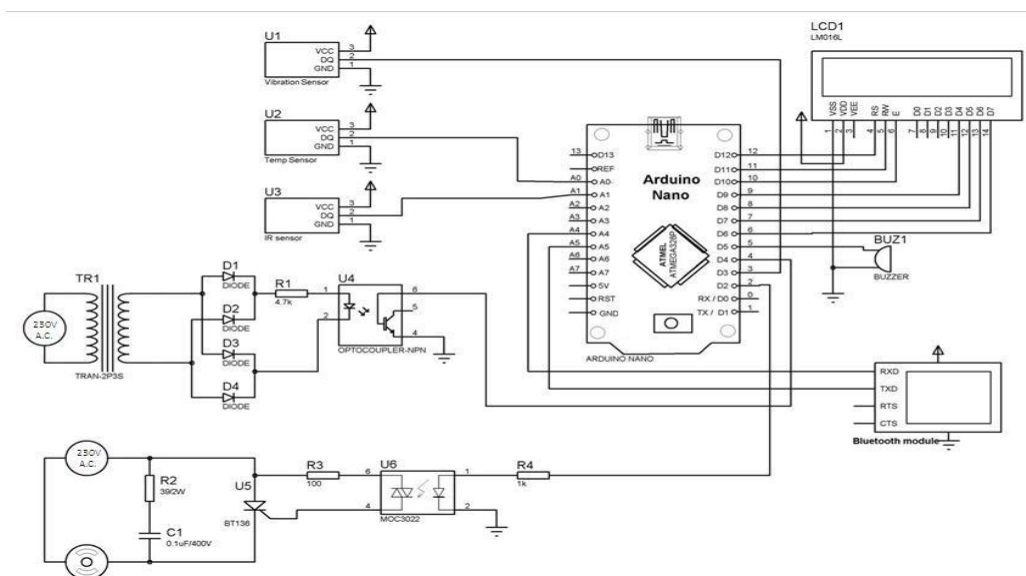
Through this system communicate with smart phone and send or receive the command or data.

Motor driver is used to control speed of the motor.



## RESULTS AND DISCUSSION

The speed of motor is controlled through the android app. The RPM of motor is measured using IR sensor and displayed on LCD. Also send to the android app. The Temperature of motor is measured using LM35 and displayed on LCD. Also send to the android app. If temperature is increased above certain limit, motor is stopped immediately to prevent from further damage. And also buzzer is turned on. The vibration of motor is measured using vibration sensor. If vibration is increased above certain limit, motor is stopped immediately to prevent from further damage. And also buzzer is turned on.



## CONCLUSION

The speed control of single phase induction motor is achieved which has been developing the interfacing between software and hardware for controlling speed of induction motor using android Bluetooth. The demand for remotely operating devices increases. The all hardware component are responded and take command from software. The project has been implemented.

## ACKNOWLEDGEMENTS

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## Working Principle

In a DC motor, supply is required to be given for the rotor winding as well as the stator winding. But in this motor, only an AC supply is fed with the stator winding.

Alternating flux is formed around the stator winding because of the AC supply. This flux rotates with the synchronous speed that is called as RMF (Rotating Magnetic Field). An induced emf can be caused by the comparative speeds between rotor conductors and stator RMF. According to Faraday's electromagnetic induction law, the rotor conductors are short-circuited, and later the rotor current is generated because of an induced emf. That's why these motors are called as induction motors.

The induction motor is an essential device in various industrial applications. These motors work on 3-phase supply and a standard temperature to keep the loads at preferred conditions. But; if any phase goes lost or there is a growth in the temperature of the windings it harms the motor. Thus, the proposed system helps to give protection to the motors in the industries by eliminating the power to the electric motor immediately if any of the phases misses out of the 3-phases, or if the motor's temperature exceeds the threshold value.

The proposed system uses a 3-phase power supply, where 3 single-phase transformers are allied to it. The project has a set of the operational amplifier which is used as comparators for relating input voltages. A thermistor is used to sense the temperature of the induction motor by connecting with the body of the induction motor. This motor is functioned by switching the main relay, which is worked by another set of relays by detecting single phasing & over-temperature conditions.

Induction motor Protection system from single phasing, over-voltage, under-voltage, overheating and phase reversal provides the smooth running of the induction motor expands its lifetime and also efficiency. Generally, these faults occur when the supply system is violating its rating. When the motor is running at rated current, load and voltage then these faults will not be generated. Generally, the smooth running of the motor can depend on the supply voltage under the set limit & load which is determined by the motor should also be under the stated limit.

Therefore, this is all about the induction motor protection system project and its working. We hope that the information which is provided in this article is very useful for you for a better understanding of this concept. Furthermore, any help in implementing electrical and electronic projects or others, you can approach us by commenting below.

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