



ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 3, March 2017

Fault Protection and Automatic on And Off of the Submersible Pumps Using Electric Smart Control Panel

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ABSTRACT: This project aims in analyzing the performance of the Submersible pumps used in agriculture and also to give protection against faults in Three Phase Induction Motor. The protection is provided for under voltage, dry run, over load, phase reversal, phase to phase unbalance, locked rotor protection. The ON and OFF of the panel and fault protection is controlled using an iOS/Android application. Application is assessed using an in-built GSM (Global System for Mobile communication) module. The GSM module is provided with the remote interface to starter (Direct on Line starter) via GSM mobile networks. GSM unit can be operated with password protection and antitheft feature. This makes user friendly operation for farmers in particular; they can start or stop the motor anywhere by using this android application. It provides electrical safety from all electrical faults as well.

KEYWORDS: GSM; iOS/Android application; Submersible pump.

I. INTRODUCTION

Automation or Industrial Automation is the use of computers to control industrial machinery and processes, replacing human operators. It is a step beyond mechanization, where human operators are provided with machinery to help them in their jobs. We may derive the key factor distinguishing automatic process is replacement of human labor with automated one. It is not necessarily there is no human labor at all, but we expect that there is no direct labor involved in the processing. Human labor can be used to input raw materials (or other resources) for processing, define processing parameters and to control the process. According to the definition of Instrumentation, Systems, and Automation Society (ISA), automatic means “functioning without intervention by a human operator under specified conditions”

II. OBJECTIVE OF THE PROJECT

The objective of the project is to design a protection circuit which will analyze the performance of the Submersible pumps used in agriculture and also to give protection against faults in Three Phase Induction Motor automatically and it is also connected to the server. The ON and OFF of the panel and fault protection is controlled using an iOS/Android application. Application is assessed using an in-built GSM (Global System for Mobile communication) module.

III. BLOCK DIAGRAM OF THE PROJECT

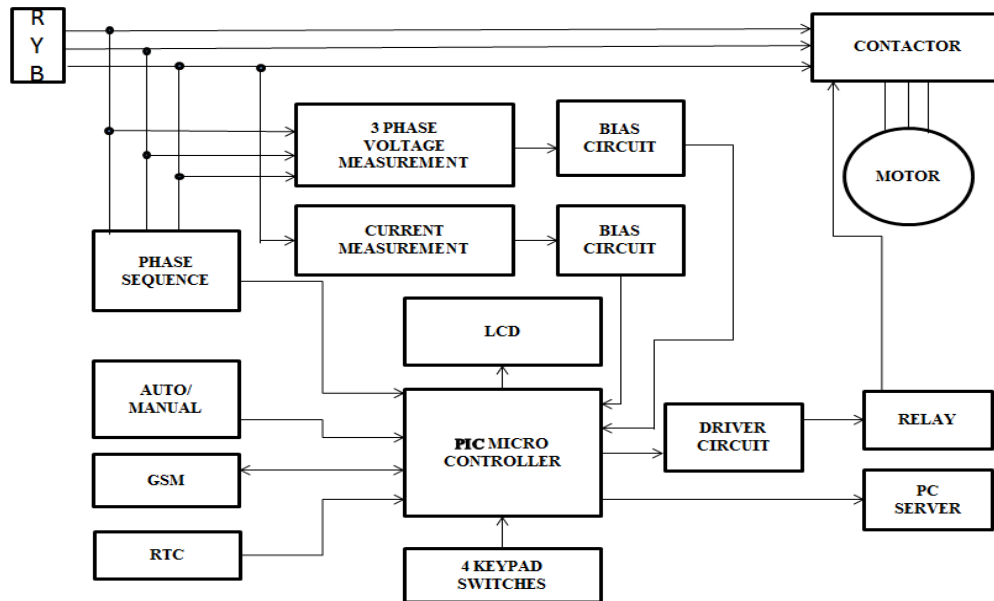


Fig.1 Block Diagram

IV. BLOCK DIAGRAM DESCRIPTION

A. MICROCONTROLLER(PIC18F4620)

The PIC18F4620 microcontrollers offer cost-efficient solutions for general purpose applications written in C that use a real-time operating system (RTOS) and require a complex communication protocol stack such as TCP/IP, CAN, USB, or ZigBee. PIC18F devices provide flash program memory in sizes from 8 to 128Kbytes and data memory from 256 to 4Kbytes, operating at a range of 2.0 to 5.0 volts, at speeds from DC to 40MHz.

The basic features of PIC18F-series microcontrollers are:

- 77 instructions
- PIC16 source code compatible
- Program memory addressing up to 2Mbytes
- Data memory addressing up to 4Kbytes.

The microcontroller program is done using MPLABIDE and is interfaced with the micro controller using mini programmer. Under voltage, over voltage and dry run values are given to the microcontroller at any time using the application. In case of any above fault the microcontroller sends signal to the GSM module and also terminates the motor operation.

B. PHASE SEQUENCE

Three phases of a three-phase AC supply attain maximum voltage when they are in a particular sequence. This sequence of three phases while they attain their maximum voltage is called as Phase Sequence. This phase sequence plays a critical role in controlling the direction of rotation of the three-phase-electrical motors. If this sequence is altered, then the direction of the motor gets altered, which may cause temporary or permanent failure of motor. So, it is important to keep the phase in sequence. Hence primarily Phase sequence is monitored and is given to the PIC microcontroller. If the phases are in sequence, the motor will operate.



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C. REAL TIME CLOCK(DS1307)

The DS1307 Serial Real Time Clock is a low power, full BCD clock/calendar plus 56 bytes of nonvolatile SRAM. Address and data are transferred serially via a 2-wire bi-directional bus. The clock/calendar provides seconds, minutes, hours, day, date, month, and year information. The end of the month date is automatically adjusted for months with less than 31 days, including corrections for leap year. The clock operates in either the 24-hour or 12-hour format with AM/PM indicator. The DS1307 has a built-in power sense circuit which detects power failures and automatically switches to the battery supply. It sends the current date and time signals to the PIC microcontroller. The date and time will be displayed in the LCD.

D. BIAS CIRCUIT

The voltages of the three phases and current are measured and are given to the bias circuit. The bias circuit will manipulate the voltages and current signals into analog signals of 5V which will be sent to the microcontroller.

E. RELAY

A relay is an electromagnetic switch operated by a relatively small electric current that can turn on or off a much larger electric current. The heart of a relay is an electromagnet; it is a coil of wire that becomes a temporary magnet when electricity flows through it. The voltage from the microcontroller is sent to the relay circuit if there is large amount of current flowing through the circuit then the normally open terminal the relay is energized and the circuit is closed. The supply to the contactor is cut off and the motor is shut down. Thus it protects the motor from short circuit condition.

F. GSM MODULE

A GSM module assembles a GSM modem with standard communication interfaces like RS-232 (Serial Port), USB etc., so that it can be easily interfaced with a computer or a microcontroller based system. The power supply circuit is also built in the module that can be activated by using a suitable adaptor. The GSM MODEM is a class of wireless MODEM devices that are designed for communication of a computer with the GSM and GPRS network. It requires a SIM (Subscriber Identity Module) card just like mobile phones to activate communication with the network. Also they have IMEI (International Mobile Equipment Identity) number similar to mobile phones for their identification. A GSM MODEM can receive, send or delete SMS messages in a SIM. The MODEM needs AT commands, for interacting with controller, which are communicated through serial communication. These commands are sent by the controller. The MODEM sends back a result after it receives a command.

V. THEORY OF OPERATION

From the three phase supply, primarily phase sequence is monitored and the signal is sent to the microcontroller. If the phases are in sequence, then the voltages and current are measured and converted into analog signals of 5V using a bias circuit which will be sent to the microcontroller. Then the microcontroller checks whether the voltages and current are within the set values. If all the above conditions are satisfied then the controller sends signal to the driver circuit which will turn on the motor via relay and contactor. With the help of GSM module, the PIC microcontroller communicates with the server using application or SMS. If the phases are not in sequence, then the LCD display displays as "Phase is locked" and also it terminates the motor operation.

VI. CIRCUIT DIAGRAM

A. 3 PHASE VOLTAGE MEASUREMENT CIRCUIT

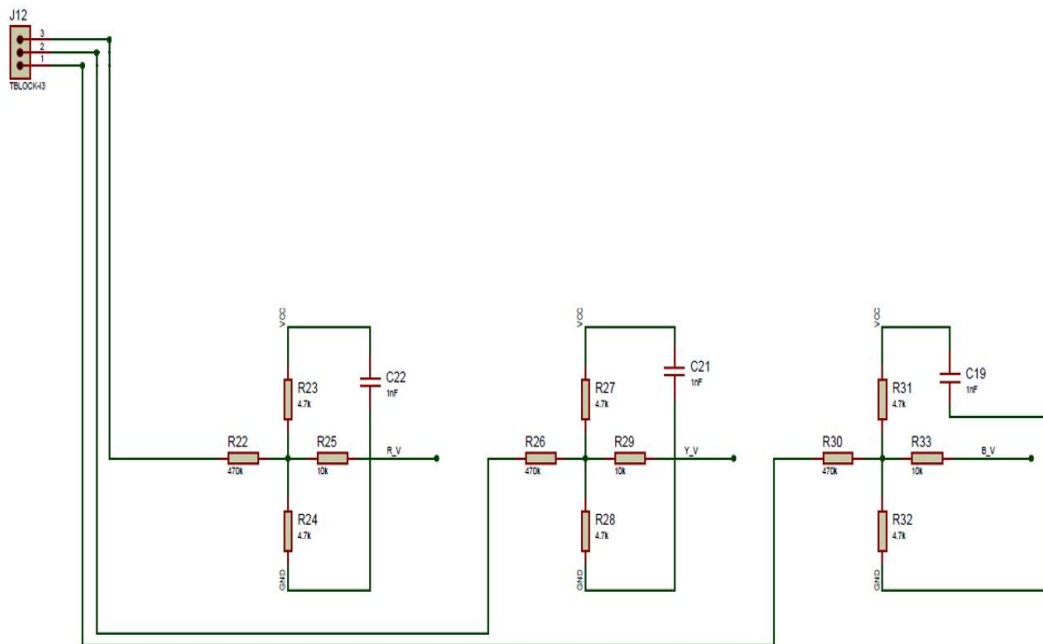


Fig.2 Three Phase Voltage Measurement Circuit

B. RTC CIRCUIT

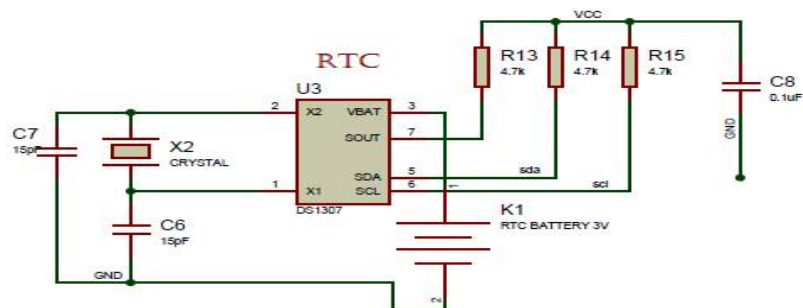


Fig.3 RTC Circuit

C. RELAY CIRCUIT

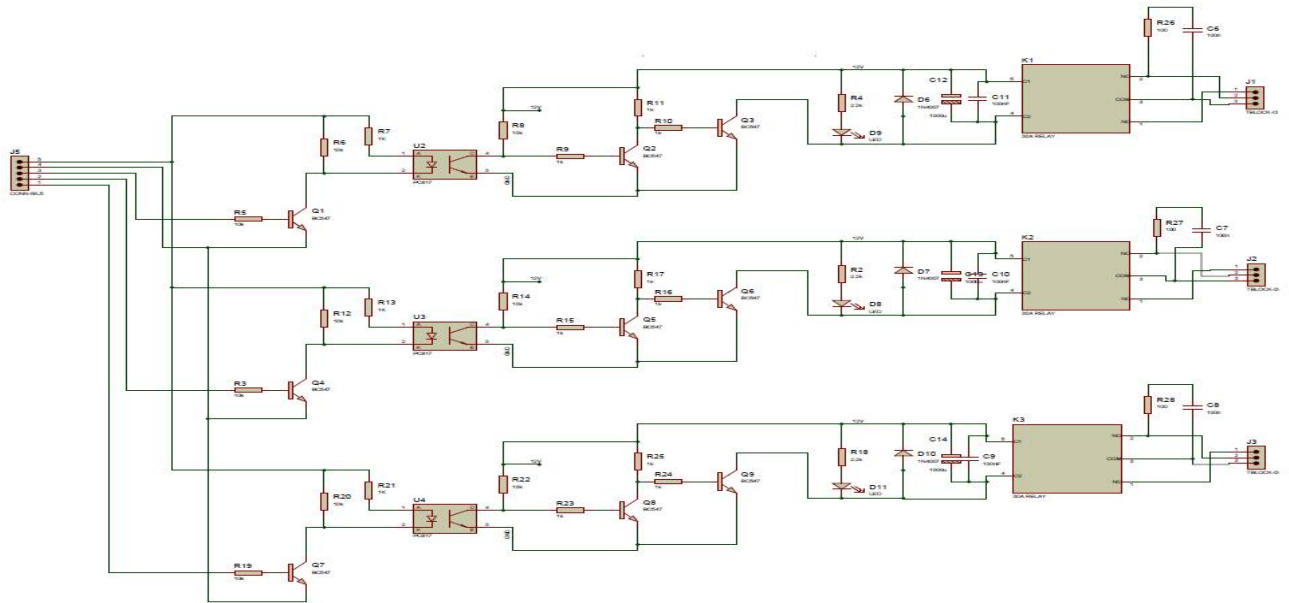
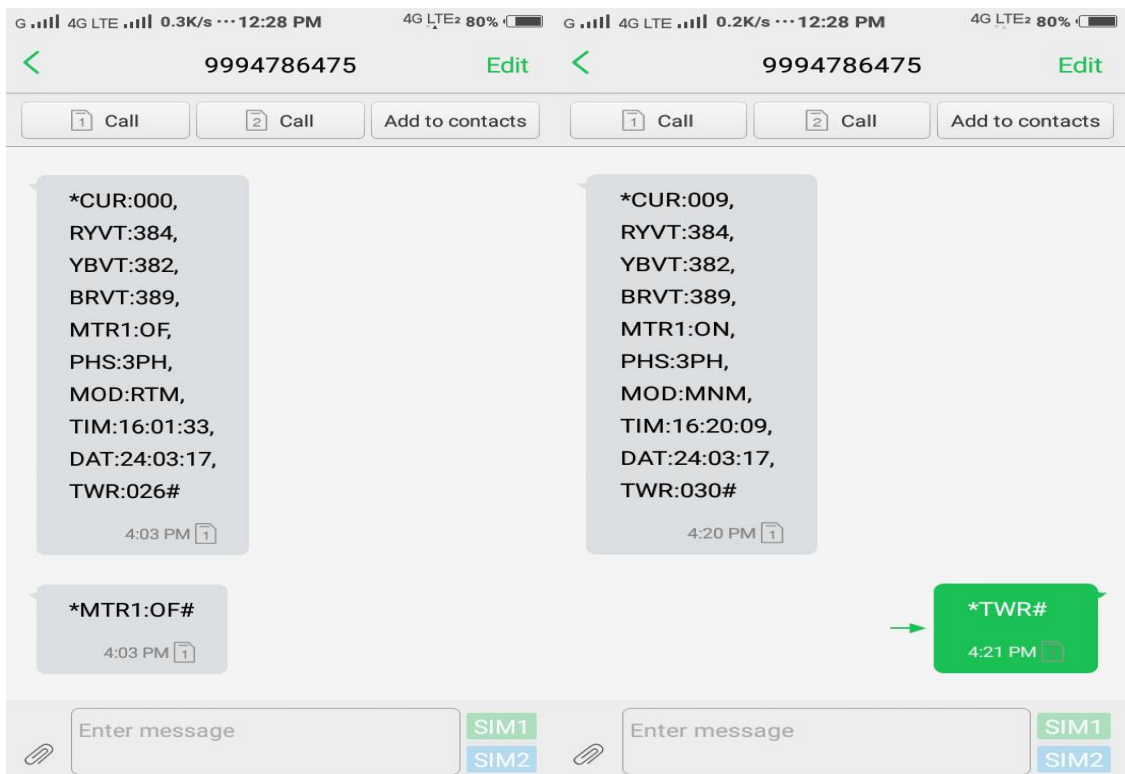


Fig.4 Relay Circuit

VII. RESULT AND DISCUSSION





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The application consist of two admins with password protection. Only these two admins can control the operation of the motor. When the application is accessed by any one of the admins, then signal will be sent to the microcontroller in the form of message request. Then the microcontroller performs the requested operation and sends back the results in the form of messages as shown in the above images to both the admins.

VIII. CONCLUSION

The ongoing motor control method, remote on and off using GSM can be replaced by this new project electric smart control panel. So as to give reliable way to control the pump and protect the motor from faults. The use of RTC makes the control system easier and can be operated from any part of the world. By using this system the farmers no need to pay the service cost as the motor is protected before the occurrence of the fault. As application is created in all regional languages it is helpful for illiterates. This can be operated in domestic and commercial fields. Especially this system is very much useful for farmers in the irrigation field.

REFERENCES

1. GSM 03.40: —Digital cellular telecommunication system (Phase 2+); Technical Realization of the Short Message Service (SMS)I, version 7.4.0 Release 1998.
2. IEEE PAPER: Emerging Trends in Engineering and Technology (ICETET), 2009 2nd International Conference on, 16-18 Dec. 2009 ., On page(s): 722 - 725 ., Print ISBN: 978-1-4244-5250-7 .
3. Real Application of Three Phase Water Pump Control and Level Sensing using GSM and Mobile IJSRD - International Journal for Scientific Research & Development| Vol. 3, Issue 02, 2015