

OPTIMAL INTERCONNECTION DEVICE FOR DISTRIBUTED ENERGY RESOURCE

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ABSTRACT: Phase Failure in phase systems are quite common faults experienced by single phase devices, failure of any phase will cause drop in operating voltage which will cause either device to stop working or three phase motor to run at lower voltages thus reducing the speed and increasing vibration due to it. Our system is designed to solve this problem and hence saving the appliance from damage. Using combination of timer ICs we measure the time, when the phase fails then the load is turned off immediately, if the phase returns before 8-10seconds then the load is switched on since the failure is detected as temporary, but if the time of failure exceeds 8-10 seconds then it is treated as permanent failure as it can cause a problem in the load connected so this time it is switched off permanently, only when the user presses the reset button again the system restarts. Hence, in case of a temporary fault the output of the IOMP project resets and in case of permanent fault it acquires permanent trip condition. This three- phase fault analysis system automatically differentiates between a temporary disturbance and a permanent fault and appropriately cuts the supply for a short duration or long duration respectively.

1.0 INTRODUCTION

In electrical system, the fault analysis is divided into two categories i.e. transient fault and permanent fault. The transient fault is for short duration. In that, faults like damage of insulation, swinging wires, little time contact with other & insulator flashover etc. occur. This fault is up to the range 70% - 90%. This is cleared by immediate tripping of circuit breakers to isolate the fault. The most common causes of transient fault are lighting. The other possible cause is temporary contact & swinging wires. Thus transient fault will vanish within few seconds. The fault which is of longer period of time is considered as a permanent fault. The range of this fault is occurring in electrical system is 10% - 30%. Disturbance on line can cause semipermanent fault i.e., if there is small

or negligible disturbance it will turn the system semipermanent fault. Semipermanent fault occurs in forested area. The fault which does not clear on tripping & reclosing is the permanent fault. Though auto reclosing success rates differ from one company to another, it is evident that the majority of faults can be successfully cleared by the proper use of tripping and auto reclosing of system. The temporary fault can be resolved by fault arc to deenergize, and then it automatically recloses the line to restore service. Accordingly, auto reclosing can significantly reduce the outage time due to faults and provide a higher level of service durability to the customer. Additionally, successful high-speed reclosing on transmission circuits can be a major factor when endeavouring to maintain system stability. For those faults, that are permanent, auto reclosing will reclose the circuit into a fault that has not been cleared, which may have unfavourable effects on system stability

A fault in a power system is any failures which interface with the normal flow of current. The cause of electric power system faults is insulation breakdown. This breakdown can be due to a variety of different factors such as

- Lightning stroke
- Spray on Insulators
- Trees coming in contact with wires
- Equipment Failure
- Human Errors

2.0 DESIGN OF HARDWARE

This chapter briefly explains about the hardware implementation of health monitoring systems using Iot and raspberry pi. It discusses the circuit diagram of each module in detail. For implementing the health diagnosis system, there is a need of essential components that are suitable and manipulate health problems. The components use generally includes temperature sensor LM-35, blood pressure sensor, heartbeat sensor, ECG sensor, ARM 7.

Arduino Uno

The most common version of Arduino is the Arduino Uno. This board is what most people are talking about when they refer to an Arduino. The Uno is one of the more popular boards in the Arduino family and a great choice for beginners. There are different revisions of Arduino Uno, below detail is the most recent revision (Rev3 or R3).

The Arduino Uno is a microcontroller board based on the ATmega328. 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 an AC-to-DC adapter or battery to get started.

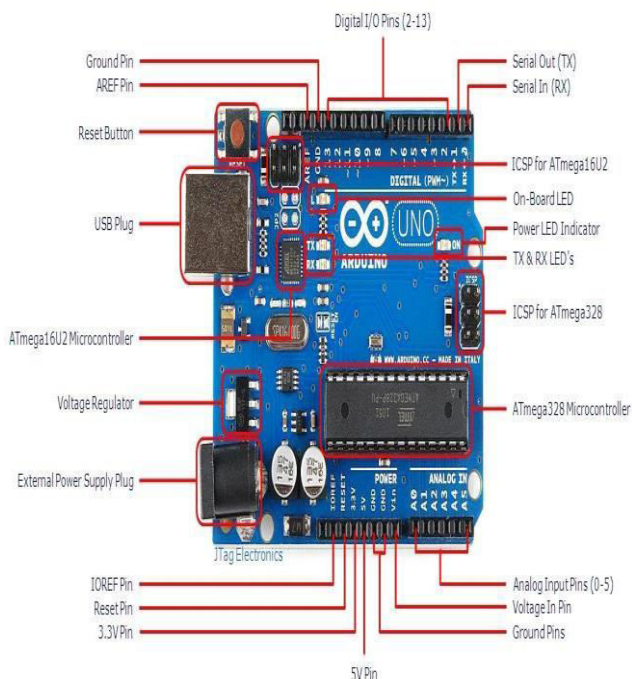


fig-4.1.1 ArduinoUno R3 Board

3.0 DESIGN OF SOFTWARE ARDUINO IDE SOFTWARE:

This is free software (evaluation version) which solves many of the pain points for an embedded system developer. This software is an Integrated Development Environment (IDE), which integrated text editor to write program, a compiler and it will convert your source code into HEX file. Here is simple guide to start working with Arduino IDE Vision which can be used for:

- Writing programs in Arduino IDE

- Compiling and assembling programs
- Debugging programs

SOFTWARE STEPS:

Before you can start doing anything with the Arduino, you need to download and install the Arduino IDE (integrated development environment).

After the opening IDE the settings are changed in order to connect to the Arduino.



Fig -3.1 Arduino IDE



Before you can start doing anything in the Arduino programmer, you must set the board-type and serialport.

To set the board, go to the following:

Tools --> Boards

Select the version of board that you are using. Since I have an Arduino Uno plugged in, I obviously selected "Arduino Uno."

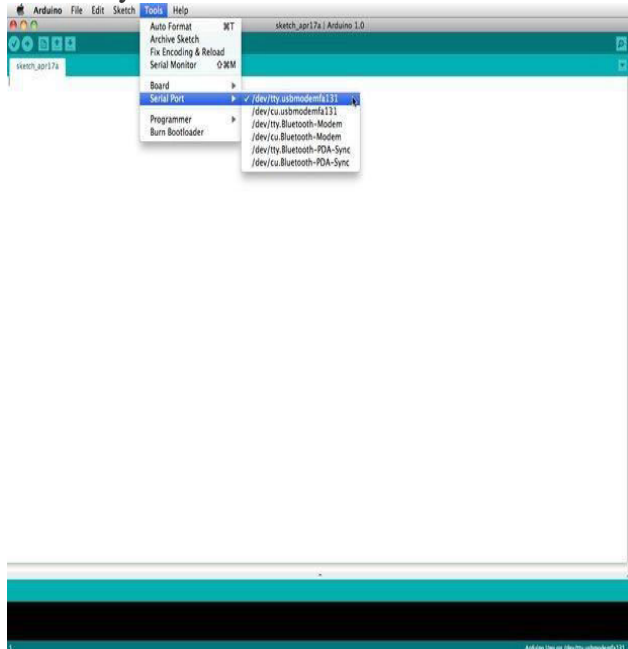


Fig -5.3 Serial Port

Arduino programs are called sketches. The Arduino programmer comes with a ton of example sketches preloaded. This is great because even if you have never programmed anything in your life, you can load one of these sketches and get the Arduino to do something.

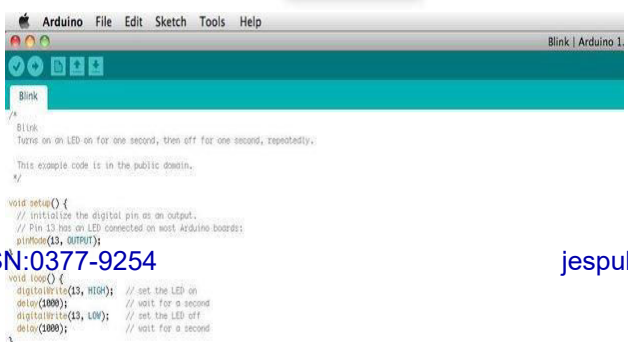
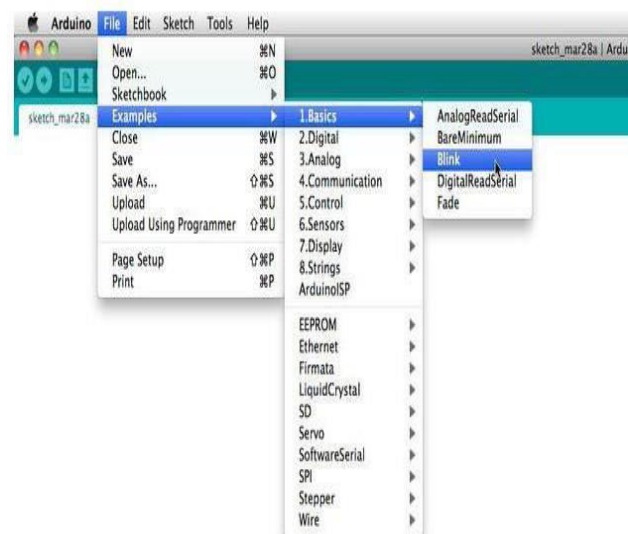


Fig -5.4 Serial Monitor

The serial monitor allows your computer to connect serially with the Arduino. This is important because it takes data that your Arduino is receiving from sensors and other devices and displays it in real-time on your computer. Having this ability is invaluable to debug your code and understand what number values the chip is actually receiving.

For instance, connect center sweep (middle pin) of a potentiometer to A0, and the outer pins, respectively, to 5v and ground. Next upload the sketch shown below:

File --> Examples --> 1.Basics --> Analog Read Serial

Click the button to engage the serial monitor which looks like a magnifying glass. You can now see the numbers being read by the analog pin in the serial monitor. When you turn the knob the numbers will increase and decrease.

The numbers will be between the range of 0 and 1023. The reason for this is that the analog pin is converting a voltage between 0 and 5V to a discrete number.

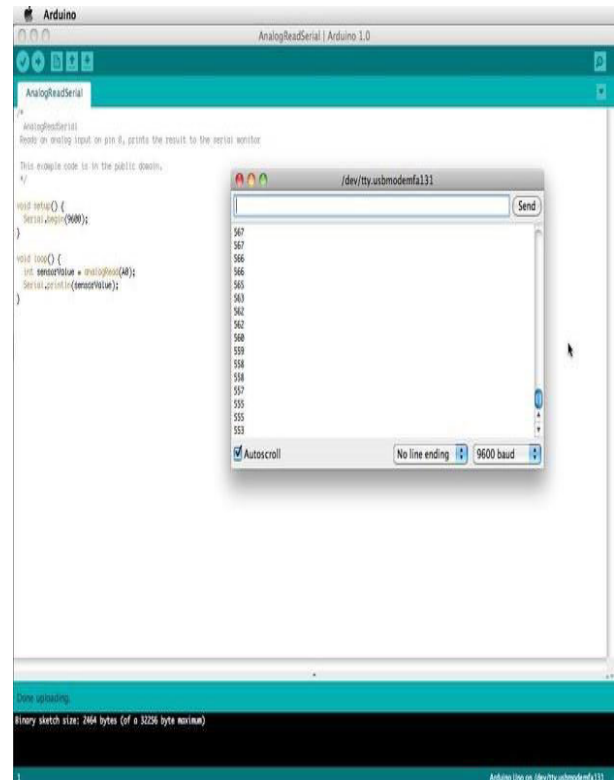


Fig -5.5 Compiler

4.0. WORKING PRINCIPLE

This chapter deals with working and circuits of “OPTIMAL INTERCONNTION DEVICEFOR DISTRIBUTED ENERGY RESOURCE OF CUSTOMER”. It can be simply

understood by its block diagram & circuit diagram.

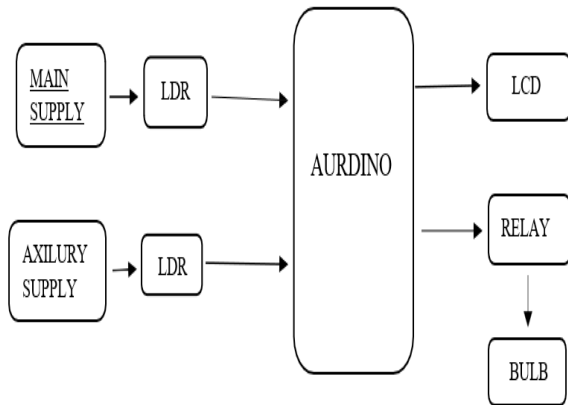


Fig -5.5 Block Diagram

In this IOMP project 1 transformers are used for the conversion 230V-12V. The low voltage i.e. 12V is used to energize entire circuit for analysis of phase fault. The output of these transformers is rectified and filtered individually to get DC voltage. This DC voltage is given to relays. To create fault i.e. line to line or line to ground fault. We connect 2 LDRS across the relay coil. All of common points of relay are grounded. The NC contacts of all 1 relay are connected to on/off the load. If any phase gets off, then only axillary supply will take into account. Through that load gets turn on continually upto main supply gets on.

Arduino's processor basically uses the Harvard architecture where the program code and program data have separate memory. It consists of two memories- Program memory and the data memory. The code is stored in the flash program memory, whereas the data is stored in the data memory. The Atmega328 has 32 KB of flash memory for storing code (of which 0.5 KB is used for the bootloader), 2 KB of SRAM and 1 KB of EEPROM and operates with a clock speed of 16MHz.

The most important advantage with Arduino is the programs can be directly loaded to the device without requiring any hardware programmer to burn the program. This is done because of the presence of the 0.5KB of Bootloader which allows the program to be burned into the circuit. All we have to do is to download the Arduino software and writing the code.

5.0 RESULTS

Using combination of timer ICs we measure the

time, when the phase fails then the load is turned off immediately, if the phase returns before 8-10seconds then the load is switched on since the failure is detected as temporary, but if the time of failure exceeds 8-10 seconds then it is treated as permanent failure as it can cause a problem in the load connected so this time it is switched off permanently, only when the user presses the reset button again the system restarts.

Therefore, it is one of the best method for the optimal interconnection device for the energy distribution to the customer without any disturbances or power loss.

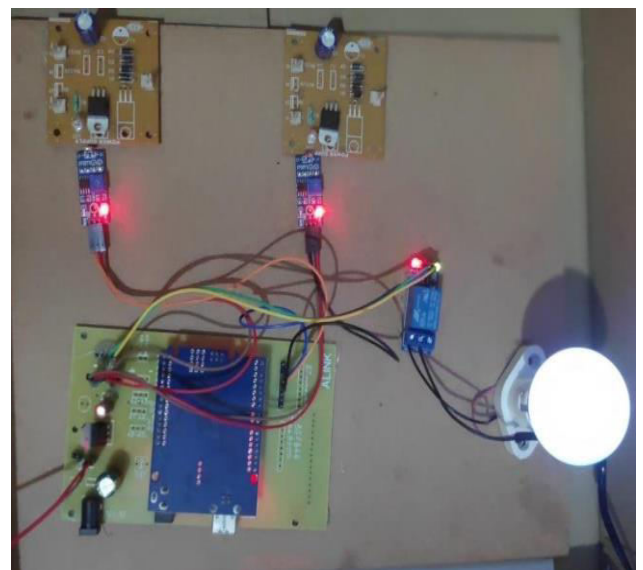


Fig-7.1: Turn ON Condition

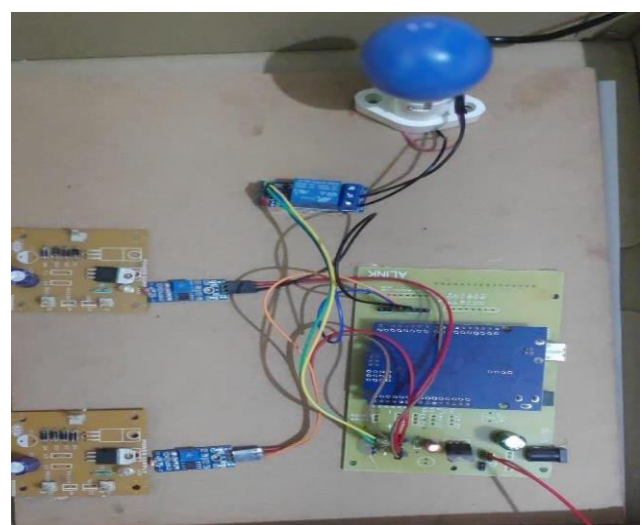


Fig-7.2: Working Condition

6.0 CONCLUSION:

This work is designed in the form of mechanism for three single phase transformers 230V to 12V of output for to develop an automatic tripping mechanism for the phase supply system while transient fault and permanent fault occurs. Here we used 555 timers with relay for the fault is temporary or permanent. Short duration fault returns the supply to the load immediately called as temporary trip while long duration shall result in permanent trip.

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