IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 8, April 2025
Impact Factor: 7.67

Automatic Overload and Load Sharing Control by using Arduino Microcontroller

Prof. Rukyabano M Sayyad, Dnyaneshwar Yerguntala, Rohit Patil, Pradnaya Bhosale
Department of E&TC
Al-Ameen Educational and Medical Foundations College of Engineering and Management Studies, Pune

Abstract: *Power failure is a short- or long-term loss of electric power to an area mostly cost cause by short circuit, damage to electric transmission line, overvoltage, faults at power stations and more commonly failure due to overloading. The possible damage areas are affected by losing power.*
The one inherent problem with standard power sharing and monitoring units is their broadcast strength. Since you must be physically close to the alarm to hear it, you might not get notified in time to prevent overload. The microcontroller-based load sharing, and control system is a device that automatically controls overload on a main line by sharing power and cut off supply once the power consumption exceeds the amount of power supplied. The control system for controlling the AC load. This is achieved by using a microcontroller PIC16F877A to automatically detect an overload and subsequently shift the supply on secondary transformer. The method used in the project provides necessary stages from overload detection to shifting of supply. The main aim of the work is to provide a non-interrupted power supply to the energy consumers. By implementation of this scheme the problem of interruption of supply due to transformer overloading can be avoided. The work was successful, and their liability level expected is commendable as this may also create room for improvement. The project was tested and observed that shift of the supply as soon as the microcontroller senses an overload on the system by the user..

Keywords: electric power

I. INTRODUCTION

Transformer is basically a static device which transfers the electrical power from one circuit to another circuit with desired change in voltage and current at constant frequency. It is only one device which operates at highest efficiency at full load condition. But abnormal condition occurs at overloading condition which may result in severe problem in future.

To avoid such condition, we are using other standby transformer which supplies the load when overloading occurs on main transformer unit, which switch on automatically by Arduino. This will result in efficient loading of both transformers. Also, when load is normal both transformers can be switched on to supply the load alternately. This will avoid the thermal overloading of transformer. Also, this arrangement will provide proper maintenance f1acility for both transformers.

The transformer is very costly and bulky equipment of power system. It operates for 24 hours of a day and feeds the load. Sometimes the situation may occur when the load on the transformer is suddenly increased above its rated capacity. When this situation occurs, the transformer will be overloaded and overheated and damage the insulation of transformer resulting in interruption of supply. The best solution to avoid the overloading is to operate the number of transformers in parallel. It is same as parallel operation of transformers where the number of transformers shares the system load. In the suggested approach second transformer will share the load when the load on the first transformer will rise above its rated capacity. The main aim of the work is to provide an uninterrupted power supply to the energy consumers. By implementation of this scheme the problem of interruption of supply due to transformer overloading or overheating can be avoided

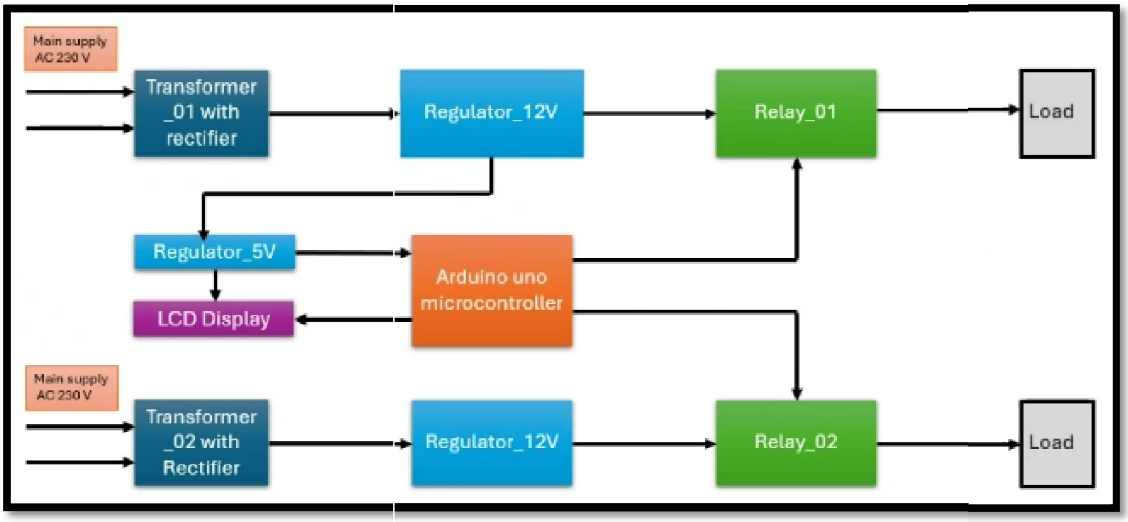
DOI: 10.48175/IJARSCT-25520

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 8, April 2025
Impact Factor: 7.67

II. LITERATURE REVIEW

Sr No.	Title	Published in year	Author	Data type & database for experimental
1	Design and construction of an Arduino-based load-shedding. management system for improving electricity consumption in a medium-sized creative office building	2023	1.Amusan Olumuyiwa 2.Benjamin Oluwamuyiwa Olorunfemi 3. AyomideFagboyo	ATmega2560 microcontrollers
2	Automatic load sharing by parallel transformer using pic microcontroller	2022	1.Rekha. 2.BinduPrakash 3. Asna. S.	Basic C programming for Arduino
3	IOT Based Overloaded Power Monitoring and Controlling System	2021	S.N. Gorade	How to control load sharing
4	Microcontroller Based Overvoltage and Overload Protection System and online notification 11	2018	A.B. Jadhav	How to switch load Sharing with automatically
5	Household power outlet overload protection and monitoring using cost effective embedded solution	2015	Mr. S.R. Patil	How to control load sharing with overload protection and monitoring

III. BLOCK DIAGRAM



Working Principle:

The Arduino microcontroller-based Automatic Overload and Load Sharing Control system operates by continuously monitoring the voltage and current levels of each generator or power source. The system's brain is the Arduino microcontroller, which is in charge of putting the load-sharing algorithm into action and controlling the switching between generators or power sources. In order to prevent damage to the generators or power sources, the system takes corrective action whenever it detects an overload condition. Based on their capacity and availability, the load sharing

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 8, April 2025
Impact Factor: 7.67

algorithm divides the load between multiple generators or power sources. The load sharing ratio is calculated by the system, which then sends control signals to relays or contactors to switch between generators or power sources in accordance. The status of load sharing and any overload conditions are communicated by the system to the user or operator. Protocols for sending data to a central control room or monitoring station are also included

The system ensures reliable operation, increases efficiency, and reduces downtime by automatically switching between generators or power sources. Because the Arduino microcontroller is able to monitor and control the system in real time, it can react quickly to changes in load conditions and make sure the system works within safe limits. In general, the Arduino microcontroller-based Automatic Overload and Load Sharing Control system manages power distribution in a variety of applications with dependability and efficiency.

Hardware Requirements

- Arduino Uno
- Power Supply
- LCD display
- Relay
- Resistors
- Capacitors
- LED's
- Switches
- POT
- Buzzer

Arduino Uno:

The Arduino Uno is an open-source microcontroller board based on the Microchip Atmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available.

The word "uno" means "one" in Italian and was chosen to mark the initial release of the Arduino Software. The Uno board is the first in a series of USB-based Arduino boards, and it and version 1.0 of the Arduino IDE were the reference versions of Arduino, now evolved to newer releases. The Atmega328 on the board comes preprogrammed with a bootloader that allows uploading new code to it without the use of an external hardware programmer.

While the Uno communicates using the original STK500 protocol, it differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it uses the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

DOI: 10.48175/IJARSCT-25520

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 8, April 2025
Impact Factor: 7.67

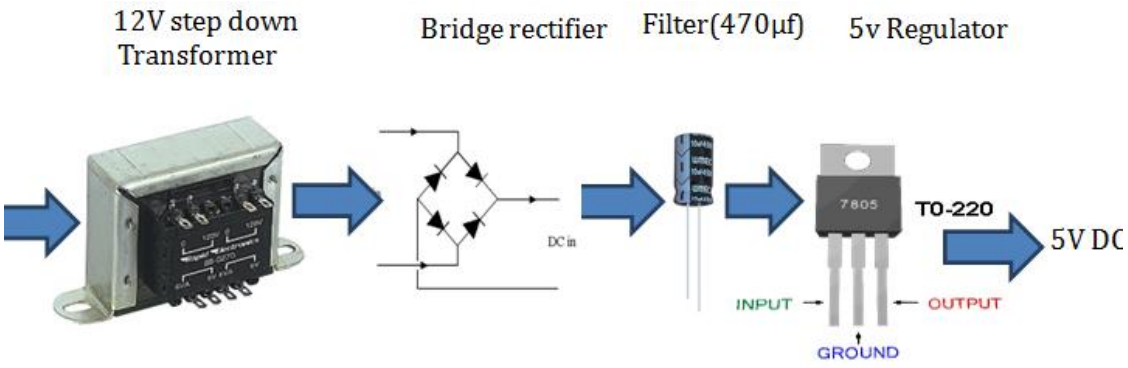
Power supply

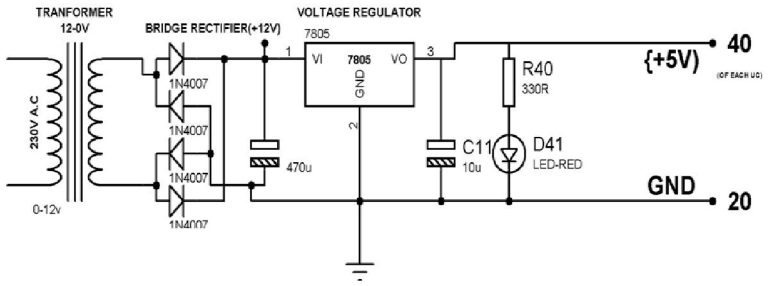
The circuit uses standard power supply comprising of a step-down transformer from 230v to 12v and 4 diodes forming a Bridge Rectifier that delivers pulsating dc which is then filtered by an electrolytic capacitor of about 470microf to 100microF.

The filtered dc being unregulated IC LM7805 is used to get 5v constant at its pin no 3 irrespective of input dc varying from 9v to 14v.

The regulated 5volts dc is further filtered by a small electrolytic capacitor of 10 micro f for any noise so generated by the circuit.

One LED is connected of this 5v point in series with a resistor of 330ohms to the ground i.e. negative voltage to indicate 5v power supply availability





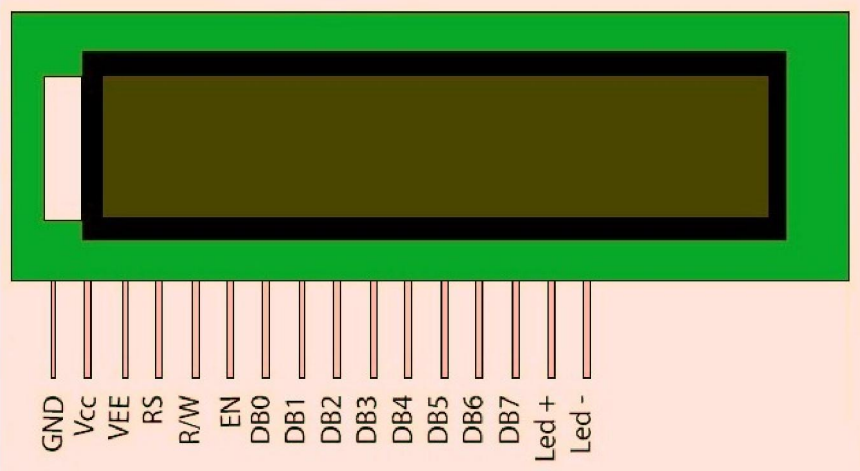
LCD Display:

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. 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.

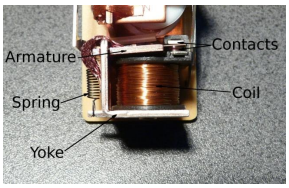
The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data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

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 8, April 2025
Impact Factor: 7.67



Relay:

A simple electromagnetic relay consists of a coil of wire wrapped around a soft iron core, an iron yoke which provides a low reluctance path for magnetic flux, a movable iron armature, and one or more sets of contacts (there are two in the relay pictured). The armature is hinged to the yoke and mechanically linked to one or more sets of moving contacts. It is held in place by a spring so that when the relay is de-energized there is an air gap in the magnetic circuit. In this condition, one of the two sets of contacts in the relay pictured is closed, and the other set is open. Other relays may have more or fewer sets of contacts depending on their function. The relay in the picture also has a wire connecting the armature to the yoke. This ensures continuity of the circuit between the moving contacts on the armature, and the circuit track on the printed circuit board (PCB) via the yoke, which is soldered to the PCB. When an electric current is passed through the coil it generates a magnetic field that activates the armature, and the consequent movement of the movable contact(s) either makes or breaks (depending upon construction) a connection with a fixed contact. If the set of contacts was closed when the relay was de-energized, then the movement opens the contacts and breaks the connection, and vice versa if the contacts were open. When the current to the coil is switched off, the armature is returned by a force, approximately half as strong as the magnetic force, to its relaxed position. Usually, this force is provided by a spring, but gravity is also used commonly in industrial motor starters. Most relays are manufactured to operate quickly. In a low-voltage application this reduces noise; in a high voltage or current application it reduces arcing.



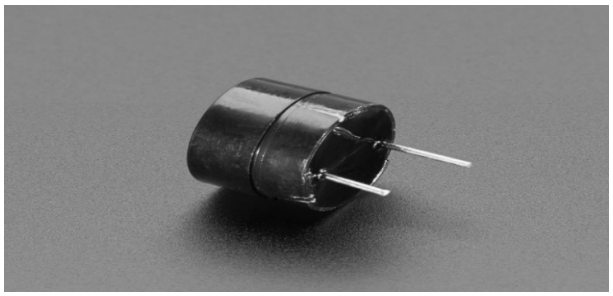
Buzzer

A buzzer takes some sort of input and emits a sound in response to it. They may use various means to produce the sound; everything from metal clappers to electromechanical devices.

A buzzer needs to have some way of taking in energy and converting it to acoustic energy. Many buzzers are part of a larger circuit and take their power directly from the device's power source.

In other cases, however, the buzzer may be battery powered so that it will go off in the event of a mains outage. Some devices that provide emergency power have buzzers on them so that the user

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 8, April 2025
Impact Factor: 7.67



V. SOFTWARE REQUIREMENTS

Arduino1.0.5
Programming Language: C

IV. ADVANTAGES

- System is working automatically. The load is shared by transformers is automatically.
- No manual intervention required.
- It prevents to damage due to overload and overheat. System reliability is high.
- This will improve the efficiency of the system.
- It protects from overloading and overheating thus providing un-interrupted power supply to the customer. No financial lost to customer.
- Cost saving related to damage of transformer and replacement cost also save

V. APPLICATIONS

- Industrial Power Systems: Automatic overload and load sharing control is crucial in industrial power systems where reliability and efficiency are paramount.
- Renewable Energy Systems: Load sharing can be used to optimize the use of renewable energy sources, such as solar or wind power.
- Data Centers: Automatic overload and load sharing control ensures reliable operation of data centers and minimizes downtime

VI. CONCLUSION

We have designed and developed the standby transformer which supplies the load when overloading occurs on main transformer unit, which switch on automatically by Arduino. This will result in efficient loading of both transformers. Also, when load is normal both transformers can be switched on to supply the load alternately. This will avoid the thermal overloading of transformer. Also, this arrangement will provide proper maintenance f1acility for both transformers.

REFERENCES

[1] SakariyaDimpal, ThummarBhumika, "Load sharing of transformers based on microcontroller" IJESET Mar,2017. volume 9, issue 4, pp.
[2] Akhil Krishnan VI, Arun P.S, "Automatic load sharing of transformer load sharing by using microcontroller" IJIRSET, issn (online):2319-8753, vol. 5, issue 4, April 2016.
[3] Laknapuram Sai Vani, Distribution and load sharing of transformer automatically by using microcontroller,
[4] Ashish R. Ambalkar, Automatic Load Sharing of Transformer, ISSN:2321 0613,1JSRD/V0L.2