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Feeder Protection for Over Load

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Abstract: The large sections of metal, such as copper or aluminium that run the electricity in a substation, distribution panel, or switchboard are called bus bars. By completing this assignment, you can prevent the bus bar from becoming overloaded. Overload is one of the main reasons mechanical devices fail to meet expectations. In order to prevent damage to the bus bar caused by overload, we are anticipating that the distribution transformer's crucial components will operate at a certain current. If the current flowing through the feeder is higher than the rated current, the feeder will be immediately damaged. Here, a strong current is generated by adding more loads to the circuit. In order to boost the current. The overcurrent will cause the circuit to trip at its exact moment. In this case, we're using a single relay that we'll power on and off using our microcontroller. In the event of an overload, our microcontroller will activate a buzzer and the entire circuit will be shut off. When the load becomes too heavy, the microcontroller will turn it off and send the data to the Arduino.

Keyword; Arduino uno, relay, laod.

1. Introduction

An electrical circuit breaker fitted with a device that may automatically seal the breaker after it has been opened due to a fault is a programmed protection of distribution network overload in electric power distribution. Overhead line power distribution networks utilize coordinated protection strategies that use programmed over-burden security mechanisms. Overload and short circuit failures are examples of temporary problems that can affect these circuits horizontally. Disabling the line until a technician can physically close the breaker or replace the blown fuse is the result of a transient event that opens the breaker contacts or gusts the conservative circuit breaker or fuse. However, a pre-programmed overload protection mechanism will try several times to either restore the line to health or reinforce it.The Internet-supported technology of Arduino has revolutionized the PC and online pastures in the modern era. This way, we can include the evolution of IoT technology into the grid. A distribution network's improved programmed over-burden safeguard mechanism locks the breaker once it has been unlocked due to a failure, without the need for human intervention. Most of the time, these networks are vulnerable to temporary issues like overloads and short circuits. Any malfunction in a conventional circuit will cause the breaker to open or the fuse to blow. This stops the line from turning over, allowing a technician to either manually replace the blown fuse or turn on the electrical switch, also known as the breaker.

1.1 Problem Statement

When planning an electrical power system, safety must be a top priority. We must safeguard key parts of the electrical power system from the potentially disastrous consequences of failure. This prolongs the life of the parts and prevents wasteful spending on constantly replacing old parts. It ensures a constant flow of electricity to meet the demands of the expanding economy. Consequently, the goal of this project is to design a microcontroller-based system that can intelligently detect defects and activate safety features to protect the feeder from power overload.

1.2 Working of the project

At its core, our project revolves around the ARDUINO UNO microcontroller.

The ARDUINO UNO microcontrollers, relay, 16*2 LCD, buzzer, bulb, feeder supply, and power supply make up the prototype module that protects the feeder from overload. A current detecting device is part of the automated overload protection system circuit that may identify power line overcurrent. Two main things can cause an electrical line to overheat: an overload or a short circuit. Consequently, the current sensor notifies the line controller circuit of these defects. The goal of this project is to generate a high current by increasing the current through the application of additional loads to the circuit. To detect the flow of current through the power line, the system's current sensor is linked in series with the line. A connection is made between the overload circuit and the CT output. The circuit will trip if an overcurrent event occurs. Our microcontroller will activate a single relay, which will trip the circuit.

1.3 Proposed Technology

Our suggested prototype model will demonstrate the idea of feeder protection against overload or short circuit, hence resolving the issues with the current system. In this setup, a current sensor monitors the feeder lines for signs of overload or short circuiting, and a microcontroller-based relay is activated to automatically switch off the load.

2. Literature Survey

V. Thiyagarajan & T.G. Palanivel **[1]** This study presents a novel approach to designing and developing an AVR micro controller-based system for substation distribution transformer voltage, current, and temperature monitoring and protection. Turning off the entire unit via radio frequency communication is the best way to protect the distribution transformer. Additionally, the system shows the identical thing on a computer at the distant main station. In addition, it may identify malfunctions brought on by excessive voltage, high temperature, or overload. Typically, the design is comprised of two units: a transmitter and display unit at the substation and a controlling unit in the main station. The AVR microcontroller continually monitors voltage, current, and temperature in the transmitter and display units in the substation. The data is shown through the display units.

Mr. Jenish Patel, Mr. Yasin Shaikh, Mr. Anas Musani, **[2]** The goal of this project is to monitor the power station's temperature and other distant electrical characteristics (such as voltage, current, and frequency) and transmit these data in real-time via the GSM network using a GSM modem or phone. In order to safeguard the electrical circuitry, this project is also built to operate a spdt relay. If any of the electrical characteristics go over the thresholds you set, this relay will come on. Turning off the primary power source is possible with the help of the relay. The user has the ability to read the electrical characteristics from a distance by sending orders through SMS. Additionally, this system has the capability to provide real-time electrical parameters via SMS at predetermined intervals. It is possible to program this system to notify the user via text message if the voltage or current rises over certain thresholds or if the relay trips. The microcontroller is an integral part of this project. The controller is able to communicate with the various sensors in an effective manner.

Dirman Hanafi, Mohamed Najib Ribuan, Izzuddin Ismail's **[3]** Using LabVIEW to Simulate an Integrated Monitoring System for Substations A novel integrated monitoring system for electric power substations operating at high voltages is detailed in this article. When it comes to transmitting electric power, the substation plays an essential role in ensuring the system's dependability and quality. Conversely, there is some evidence that being in an area with high voltage can be harmful to human health. Consequently, it is essential to install an integrated monitoring system to make substation control and monitoring easier and to reduce human involvement with substation components. An integrated Graphical User Interface (GUI) built using LabVIEW software displays all the conditions of the substation components. A number of windows, including the one in question, make up the developed display. Consequently, the substation devices' parameters may be shown and monitored, including: power, temperature, oil level, load impedance, reluctance, voltage, cooling condition, and protective system.

3. Block Diagram

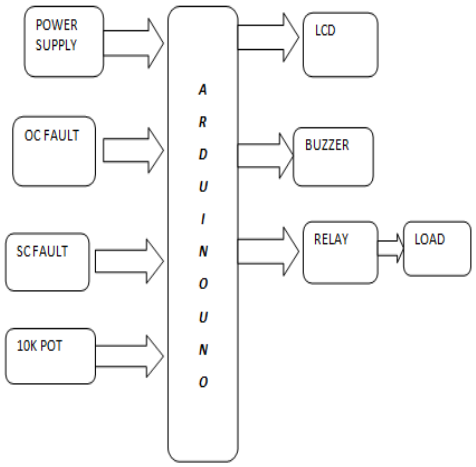

Fig.3.block diagram

3.1 Arduino Uno

The ATmega328 is the basis of the microcontroller board known as the Arduino Uno (datasheet). A reset button, a power connector, a USB connection, a 16 MHz ceramic resonator, six analog inputs, fourteen digital input/output pins (six of which may be used as PWM outputs), and one ICSP header round out the device. It comes with all the necessary components to support the microcontroller; all you need is a USB cable, an AC-to-DC adapter, or a battery to begin. Unlike all of its predecessors, the Uno doesn't have the FTDI USB-to-serial driver chip. The Atmega16U2 (or Atmega8U2 up to R2), which is a USB-to-serial converter, is instead featured.

Fig.3.1 Arduino Uno

3.2 Power Supply

The power supply for this project is regulated at 5V and 500mA. When controlling voltage, a 7805 three-terminal regulator is ideal. When a 230/12V step-down transformer's secondary AC output needs rectification, a bridge type full wave rectifier is the way to go.

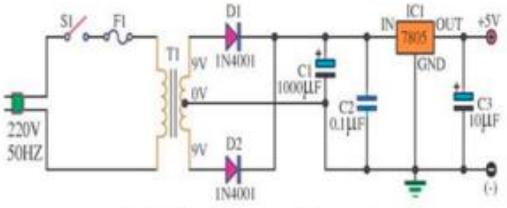

Fig.3.2 Block diagram of power supply

3.3 LCD

Liquid Crystal Display is the trademark of LCD. A variety of electronic devices, including calculator displays, mobile phone screens, television sets, computers, and more, make use of liquid crystal display (LCD) modules. The 16x2 LCD display is employed in this suggested module. The pixel matrix, with its 16 columns and 2 rows, and the potential for 32 characters, is shown by the representation, which is 16× 2. The pixel count per character is 40 pixels since each character is made up of 5×8 pixel dots. The LCD screen is compatible with a wide range of devices and is inexpensive.

Fig.3.3 LCD display

3.4 Relay

A switch that is powered by electricity is called a relay. A solid-state relay is one type of relay; others employ an electromagnet to mechanically drive a switch. If you need to control several circuits with a single, low-power signal or if you need to provide total electrical isolation between the control and controlled circuits, a relay is the way to go. In the early days of long-distance telegraph networks, relays served as amplifiers, re-transmitting the signal that had come in from one circuit to another. Telephone exchanges and early computers relied heavily on relays to execute logical functions.

Fig.3.4 relay module

3.5 10k Potentiometer

For adjusting a system's electrical settings, potentiometers are invaluable. This is a 10k potentiometer with a knob that can be turned one full revolution. A rotary potentiometer, or POT for short, is another name for this kind of potentiometers. You may adjust the resistance of these three-terminal devices from zero to tens of kiloohms by turning a knob. For added style, you may use a potentiometer knob in conjunction with this POT.

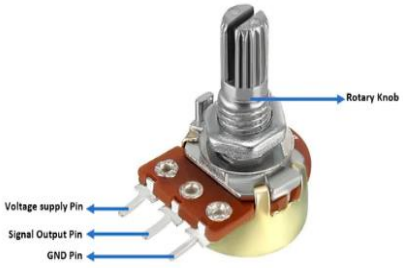

Fig.3.5 10k potentiometer

3.6 OC Fault and SC Fault

Depending on the nature of the power line failure, voltage and current might be impacted in various ways. Voltage drops as a result of increased current flow and voltage drop across the faulty portion of the line, whereas current spikes as a result of the abrupt drop in impedance in the event of a short-circuit failure. Due to the lack of current flow and voltage buildup in the unfaulted segment of the line, the voltage can grow in an open-circuit fault, but the current can decrease or reach zero.

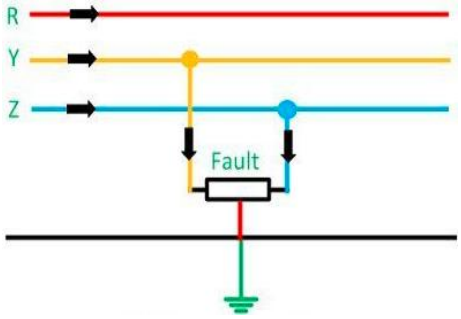

Fig.3.6 Single line to ground fault.

3.7 Buzzer

Buzzing is a beeping sound that is produced by a device known as a buzzer. While there are a variety of buzzers on the market, the piezoelectric buzzer is often considered the most basic. The device consists of two electrodes with a flat piece sandwiched in between. They don't cost a fortune and can still make a lot of noise even when anything is wrong without using a lot of electricity. A voltage proportional to pressure can be generated by the piezoelectric material. As part of our project, the buzzer serves as an alarm notification system.

Fig.3.7 buzzer

4 Project Output Results

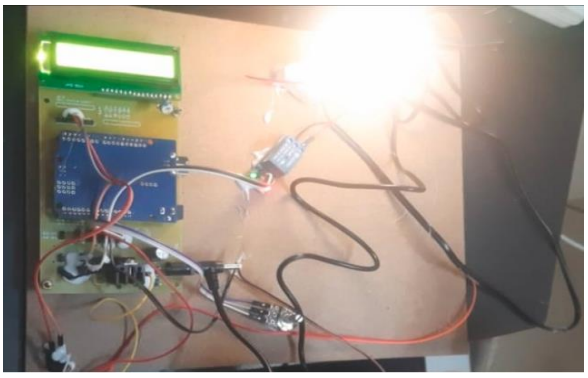

Fig.4.1 Project final output results

5. Conclusion

This project taught me how to estimate the voltage of each feeder line in order to sort out and examine the overload condition of those lines. The system is meant to continually supervise and regulate the load in this predicted job. The globe is currently undergoing a dramatic shift away from antiquated technologies and toward smart grid technology, which is more dynamic and efficient. The goal of this project is to provide a system for electricity distribution in which problems similar to load shedding are common.

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