**Microcontroller based Automatic 3-Phase Selector for Load Controller in Home Applications**

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**SUBMISSION OF GRADUATION PROJECT FOR PARTIAL FULFILLMENT OF THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER APPLICATION**

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**AUGUST 2024**

**1.0 Introduction**

residential applications, efficient load control and power management are crucial for ensuring stable and reliable electrical systems. In three-phase electrical systems, achieving balanced load distribution across the available phases is essential to prevent overloading, minimize voltage fluctuations, and optimize power utilization. Manual load control methods can be inefficient and inconvenient, requiring constant monitoring and adjustment. To address these challenges, the development of a microcontroller-based automatic 3-phase selector for load control in home applications offers a promising solution.

Three-phase power systems are widely used in residential, commercial, and industrial settings due to their higher power-carrying capacity and improved efficiency compared to single-phase systems. In a three-phase system, power is distributed across three phases, typically denoted as phase A, phase B, and phase C. Each phase carries a sinusoidal waveform with a phase difference of 120 degrees. Achieving balanced load distribution across these phases is critical for maintaining system stability and optimal power utilization.

Manual load control methods, where users select the phase for connecting loads, can lead to imbalanced load distribution. Users may lack the necessary knowledge of the current load on each phase, resulting in overloaded phases or underutilized phases. This imbalance can lead to voltage fluctuations, increased power losses, reduced system efficiency, and potential damage to electrical equipment. Additionally, manual load control can be inconvenient and time-consuming, especially in scenarios where frequent load changes are required.

To overcome these challenges, a microcontroller-based automatic 3-phase selector system can be designed. By utilizing a microcontroller, current sensors, relay modules, and a user interface, the system can intelligently monitor the load on each phase and automatically distribute the load to achieve balanced load distribution. The microcontroller continuously measures the current flowing through each phase using current sensors, processes the data, and determines the optimal load distribution based on predefined load balancing algorithms or user-defined preferences. The relay module is then controlled by the microcontroller to switch the load connections, redistributing the loads across the phases.

The automatic 3-phase selector system offers several benefits, including balanced load distribution, efficient power utilization, convenience, and real-time monitoring. By ensuring balanced load distribution, the system prevents phase overloading and minimizes voltage fluctuations, leading to improved system stability. Optimal load distribution also maximizes power utilization, reduces power losses, and enhances energy efficiency. Furthermore, the automation of load control eliminates the need for manual intervention, providing convenience and saving time for users. The user interface allows users to monitor the system status, view load distribution information, and make manual adjustments if required.

The microcontroller-based automatic 3-phase selector has various applications in residential power distribution, renewable energy integration, load shedding, demand management, and smart homes. It can be integrated into existing electrical systems or incorporated into new installations to enhance load control and power management capabilities. By implementing this technology, homeowners can benefit from improved energy efficiency, reduced costs, and a more streamlined and convenient user experience in their electrical systems.

**1.1. Background of study**

In developing countries like Nigeria, there is always the problem of interrupted power supply as insufficient power is being generated to provide consumers with continuous services and satisfactory quality. This leads to constant power failure which in turn affects both the public and private sectors of the economy. Industries, banks, hospitals and so many other public and private establishment all have major critical loads that needs to be powered at all times in order to carry out various processes efficiently . Also load demand is increasing on daily basis; the major problem consumers are confronting is power interruption. Due to this power break, a lot of damage is caused to household appliances and occasionally to life. The problem of power pause originated from single phase faults in distribution system while power is available in other phase(s) . While most domestic loads are connected to single phase supply and if the fault occurs in any one of the phases and the power is available in other phases, we cannot utilize that power. There is therefore a need to automatically switch from one phase to other and auxiliary supply when there is a power failure in any one or all of three phases of the power supply The introduction of some of these alternative sources of power supply brings forth the challenge of switching smoothly in a timely manner between the mains supply and the alternative sources whenever there is a failure on the mains source. Automatic three phase selector is an integral part of the process of power generation, allowing smooth and instant transfer of electric current between multiple sources and load . The function of the automatic three phase selector is to monitor the incoming public supply voltage and detect when the voltage drops below a certain level that electrical/electronic appliances can function depending on the utility supply. The compares the automatic three phase selector voltage of the other two phases using a comparator circuit and if the voltages are not available, the system changes over from public supply to generator. When the generator is in operation, it prevents any feedback current to the load. It also ensures that the different power sources are synchronized before the load is transferred to them. The transfer switch senses when there is interruption if the mains supply remains absent . The principle of the automatic three phase selector is such that it links the load and mains supply or the alternative supply together. This enables the use of either the mains supply or an alternative source when there is outage on the mains source which can either be a three phase or a single phase .

**1.2. problem of the statement**

As load demand is increasing on a daily basis, the major problem consumers are confronting is power interruption. Due to this power break, a lot of damage is caused to household appliances and, occasionally, to life. The major problem of power pause originated from single-phase faults in the distribution system while power is available in other phases (Adedokun, 2010). While most domestic loads are connected to a single-phase supply, if a fault occurs in any one of the phases and the power is available in the other,

phases, we cannot utilize that power. There is therefore a need to automatically switch from one phase to another when there is a power failure in any one of the three phases of the power supply.

In modern homes, the utilization of multiple electrical appliances and devices has become commonplace, often requiring a balanced distribution of power across three-phase sources. However, the lack of an efficient and automated 3-phase selector poses challenges in optimal load management, leading to uneven power distribution and potential equipment damage. This project aims to address these issues by developing a microcontroller-based Automatic 3-Phase Selector that intelligently monitors power usage, switches between available phases, and ensures a balanced load distribution for enhanced energy efficiency and appliance longevity. The system will provide a seamless and reliable solution for homes, contributing to the optimization of power utilization and promoting a sustainable and efficient energy environment.