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IOT Based Auto Selection of any Available Phase in Three Phase Supply System

Anandrao Bhaguji Gofane[1], Rushikesh Mahadev Ghambare[2], Dinesh Anand Sawant[3], Ganesh Kaka Dhaware[4], Prof. S. S. Bhosale[5]

Student, Department of Electrical Engineering, Dattakala group of Institution, Swami-chincholi, Daund, Maharashtra, India[1-4]

Guide, Department of Electrical Engineering, Dattakala group of Institution, Swami-chincholi, Daund, Maharashtra, India[5]

Abstract: Phase absence is a very common and severe problem in any industry, home or office. Many times one or two phases may not be live in three phase supply. Because of this, many times, some electrical appliances will be on in one room and OFF in another room. This creates a big disturbance to our routine work. 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 phases. 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. This system added the Iot system to get information of phase.

Keywords: IOT, phase selection, controller.

I. INTRODUCTION

In developing countries like India, 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. 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.

Phase absence is a very common and severe problem in any industry, home or office. Many times one or two phases may not be live in three phase supply. Because of this, many times, some electrical appliances will be on in one room and OFF in another room. This creates a big disturbance to our routine work. 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 phases. 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.

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II. PROBLEM DEFINITION

- Phase absence is a very common and severe problem in any industry, home or office.
- Many times one or two phases may not be live in three phase supply. Because of this, many times, some electrical appliances will be on in one room and OFF in another room. This creates a big disturbance to our routine work.
- 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 phases. 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.

III. SCOPE OF PROJECT

During earlier days, phase selector switch which performs manual switching of load to available phase. When the failure phase gets restored, the consumer should change manual switch to the original phase, if it is not so, this creates load unbalancing in the distribution transformer. By implementing automatic phase selector, the load is automatically connected where the phase voltage is available. Also it reconnects the load to their own phase, when the failure phase gets restored.

IV. LITERATURE REVIEW

Shivraj Patil, and et al., (2018) Presented the phase absence is a very common and severe problem in any industry, home or office. Many times one or two phases may not be live in three phase supply. Because of this, many times, some electrical appliances will be on in one room and OFF in another room. This creates a big disturbance to our routine work. 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 phases. 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.

Chaitalee P. Bhise, and et al., (2017) presented the three phase supply where only single phase is used to run the equipment such as load of Operation Theater in hospitals, commercial Internet servers. In some cases if phase supply voltage is low in any of the load driving phase and if you wish to run all the equipment in proper way as required then you must be sure about the continues and normal single phase electrical supply. By the use of proper TPDT relay logic we can instantly select proper available phase and avoid the short circuit condition between the different phases. However fuse of proper rating should be used in three phase's i.e. inputs lines. At that time correct voltage must be available for driving the load. in the building, to run all the equipment on the single phase we have to shift low voltage phase to the correct available phase voltage by using electrical component such as transformer, under voltage, overvoltage protection and TPDT relay.

Mothilal T, and et al., (2019) presented the three phase supply where also we use single phase to run the single phase equipment. Such as load of operation theater in hospitals, commercial internet servers. We have to use proper relay logic circuits with arduino programming then reduce these problems. Here, the three phase system should be change as single phase. That may be as one phase or two phases, both phases are act as a single phase for single phase machines using arduino programming with relay circuit. So, the losses are reduced and single phase equipment is run by this method

Niranjan V. Hendwe, and et al., (2020) presented the power failure is a common problem. It affects the production of industry, construction work of new plants and buildings. It can be beat by using a backup power supply. But it is cost reliance and also time consuming as certain time is required to switch on the generator manually. It is often noticed that power interruption in distribution system is about 65% for single phase faults while other two phases are in normal condition. Thus, in any commercial or residential power supply system where all phases is available, an automatic phase selector system is required for regulated power to critical loads in the event of power failure in any phase.

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There is no demand of backup power supply in that case. Also there is no time required as the phase is changed automatically within a few seconds. The main aim of this paper is to present the real idea of an automatic phase switch for 230V to 240V AC. Although, there are most of the designs that can perform almost similar functions like, single phase change-over switches, two phase automatic transfer switch and three phase automatic change-over switch, but this model is about an automatic phase switchover which is designed for only three phase alternating current input power to single phase output applications.

Thangam E, and et al., (2022) presented the Three Phase Power Supply Phase Selector device is critical for the operation of all medical equipment, particularly medical ventilators. Because of COVID 19, the need for ventilators has increased significantly. However, hospitals in rural areas are experiencing single-phase failure and low voltage in distribution lines, which causes interruptions in ventilator operation. This paper proposes an automatic Three Phase Power Supply Phase Chooser with a Programmable Logic Controller (PLC) to keep all medical ventilators running without disruption, especially in the occurrence of single-phase failure. During a phase failure, the proposed system automatically connects the ventilator to the available phase in a very short period. The PLC detects the restoration of the phase of the single-phase supply and automatically reconnects the ventilator to the restored phase. It also aids in maintaining an uninterrupted power supply to critical single-phase medical appliances. It also protects sensitive single-phase medical equipment from damage and burnout. This system can be used in a variety of locations where critical single-phase medical equipment must operate continuously and without disruption. The key benefit of this controller is that it is reliable, easily programmable, and flexible.

Nirbhay Singh, and et al., (2017) presented the phase absence is a very common and severe problem in any industry, home or office. Many times one or two phases may not be live in three phase supply. Because of this, many times, some electrical appliances will be on in one room and OFF in another room. This creates a big disturbance to our routine work. This project is designed to check the availability of any live phase, and the load will be connected to the particular live phase only. Even a single phase is available, and then also, the load will be in ON condition. This controller continuously checks for live condition of all phases connected to it, and the controller connects the load to the active phase using a Relay. This relay is driven with a transistor. If two or three phases are live, the load will be connected to phase I only. An LCD is provided to display the status of the phase condition. Contrast control preset is given for LCD contrast control.

V. DIAGRAM

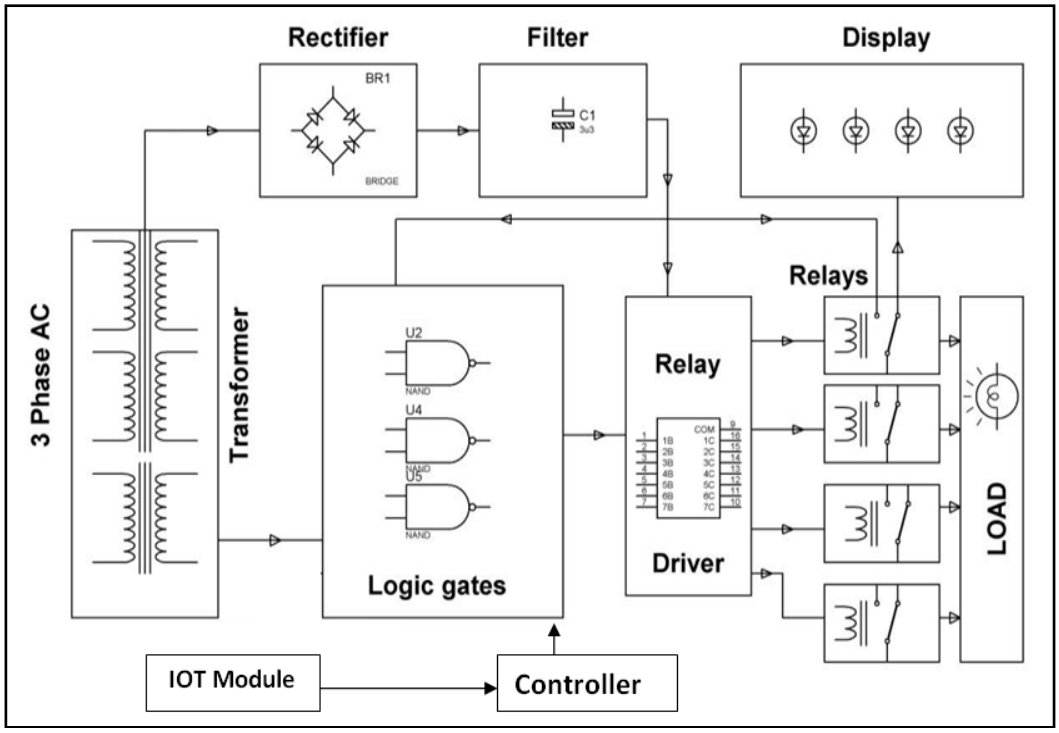

Figure: Block diagram of Iot based auto selection of any available phase

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Component Description:

5.1 Transformers:

A transformer is an electrical device that transfers electrical energy between two or more circuits through electromagnetic induction Transformers convert AC voltage from one level to another level with a little loss of power.

A transformer operates on the principals of "electromagnetic induction", in the form of mutual induction. The transformer used here is a step-down transformer so that it can be directly fed to the measuring devices by rectification.

5.2 Relay:

Relays are components which allow low power circuit to operate high current application circuits. It is an electrically operated switch and is used where it is necessary to control a circuit by a low-power signal with complete electrical isolation between control and controlled circuits, or where several circuits must be controlled by one signal. The relay used here is of electromagnetic type.

5.3 Voltage Regulator (7805):

- Output Current up to 1A.
- Output Voltages of 5, 6, 8, 9, 10, 12, 15, 18, 24V.
- Thermal Overload Protection.
- Short Circuit Protection.
- Output Transistor Safe Operating Area Protection.

5.4 Filter:

Capacitive filter is used in this project. It removes the ripples from the output of rectifier and smoothens the D.C. Output received from this filter is constant until the mains voltage and load is maintained constant. However, if either of the two is varied, D.C. voltage received at this point changes. Therefore a regulator is applied at the output stage.

The simple capacitor filter is the most basic type of power supply filter. The use of this filter is very limited. It is sometimes used on extremely high-voltage, low-current power supplies.

5.5 Arduino Nano:

- Arduino Nano is a small, complete, flexible and breadboard-friendly Microcontroller board, based on ATmega328p, developed by Arduino.cc in Italy in 2008 and contains 30 male I/O headers, configured in a DIP30 style.
- Arduino Nano Pinout contains 14 digital pins, 8 analog Pins, 2 Reset Pins & 6 Power Pins.
- Arduino Nano is simply a smaller version of Arduino UNO, thus both have almost the same functionalities.
- It comes with an operating voltage of 5V, however, the input voltage can vary from 7 to 12V.

5.6 IOT:

The Internet of Things (IoT) describes the community of bodily gadgets-"things"-which might be embedded with sensors, software, and different technology for the motive of connecting and changing statistics with different gadgets and structures over the internet.

These gadgets variety from normal family gadgets to state-of-the-art business tools. With greater than 7 billion linked IoT gadgets today, professionals are watching for this variety to develop to ten billion via way of means of 2020 and 22 billion via way of means of 2025. Oracle has a community of tool partners.

VI. WORKING OF THE PROJECT

1. When Phase I is active at that time relay 1 active to ON the Load. LED will glow to indicate.
2. When Phase II is active at that time relay 2 active to ON the Load. LED will glow to indicate.
3. When Phase III is active at that time relay 3 active to ON the Load. LED will glow to indicate.
4. So Phase I is selected by default in order to run the single phase load when all three phases will active.
5. In the absence of Phase I, Phase II is selected to run the single phase loads.
6. If the phase II is absent then the phase III is selected to run the single phase loads.
7. In the presence of the first phase the phase selection will be switched to the first phase.
8. The phase on which the single phase load is being run will be displayed on the LED.
9. All the Process repeat continuously by the Present Condition Respectively.

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VII. CONCLUSION

❖ The proposed system is designed to provide uninterrupted power supply to load and monitoring with Iot

❖ In this system we designed automatic phase changeover switch by using logic gates and auto selection is achieved by using a set of relays.

❖ This project can be implemented in colleges, hospitals, houses, banks etc. where the load is single phase and the power supply is 3 phase

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