# AUTO SELECTION OF ANY AVAILABLE PHASE IN THREE PHASE SUPPLY SYSTEM

[1]Shivraj Patil, [2]Vilas Pund, [3]Roshan Mahajan, [4]Kiran Sakare, [5]Mrityunjaya Patted

[1234]Student, [5]Assistant Professor

[12345]Department of Electrical Engineering

[12345]JSPM'S Bhivarabai Sawant Institute of Technology and Research Wagholi, Pune 412207

*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.

*Index Terms: Three phase Transformers, Regulated Power supply, Relay Driver, logic gates, IC7400.*

## 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.

## II. LITERATURE SURVEY

Power failure is a common problem. It is often noticed that power interruption in distribution system is about 70% for single phase fault while other two phases are in normal condition. Thus, in any commercial or domestic power supply system where 3 phases is available, an auto phase selector system is required for uninterrupted power to critical loads in the event of power failure in any phase [1]. In any commercial or domestic power supply system where 3 phase is available, it is advisable to have an automatic changeover system for uninterrupted power to critical loads in the event of missing phase. In this system auto selection is achieved by using a set of relays interconnected in such a way that if one of the relay feeding to the load remains energized always [2].Power supply in Nigeria and most developing countries of the world is anything but stable. In this paper, we provide an automatic switching mechanism that transfers the consumer loads to a power source from a generator in the case of power failure in the mains supply. It automatically detects when power has been restored to the mains supply and returns the loads to this source while turning off the power from the generator set [3].

## III. SYSTEM ARCHITECTURE

The figure 1 illustrates how the various modules involved in the system had been implemented. All the modules are inter-connected to each other and are independent of load connected. The hardware architecture consists of a phase sensing, control logic, power supply, display unit, relay driver and DC relays

The control logic circuit chooses the phase priority for one out of three phases. The relay-driver section drives the relay according to the signal received from the control logic unit while the power supply provides the power to phase sensors, control logic and relay driver sections. The relay connects the load to the best available phase through the contacts that are fed from all the three phases.

The NAND gate operates as an AND gate followed by a NOT gate. It acts in the manner of the logical operation "and" followed by negation. The output is "false" if both inputs are "true." Otherwise, the output is "true.
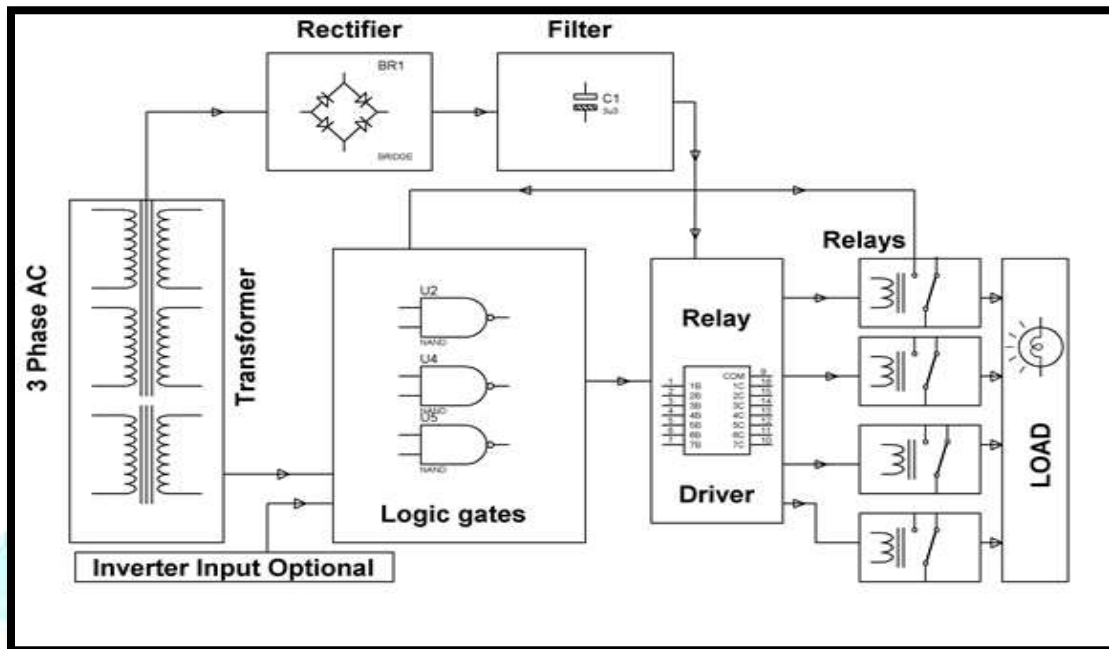


**Figure 1. Block diagram of auto selection of any available phase in three phase supply system**

## IV. SIMULATION ARCHITECTURE

The simulation was carried out in Proteus software. All the components are arranged as shown in the figure 2 below in project window of the software. The main three phase supply is stepped down to 12v by 3 single phase transformers attached to the each phase. Then the 12v is passed through full bridge rectifier and we obtain 12v dc supply which is required for running the relay drivers and NAND gate IC 7400.

In normal working condition when there are no faults, the first phase supplies the single phase load and the relays of the other phases remain normally open. When fault occurs in that phase, the NAND gate IC sends signal to the relay driver and the relay connected to the next healthy phase becomes normally closed and thus the supply to the single phase load remains unaffected.
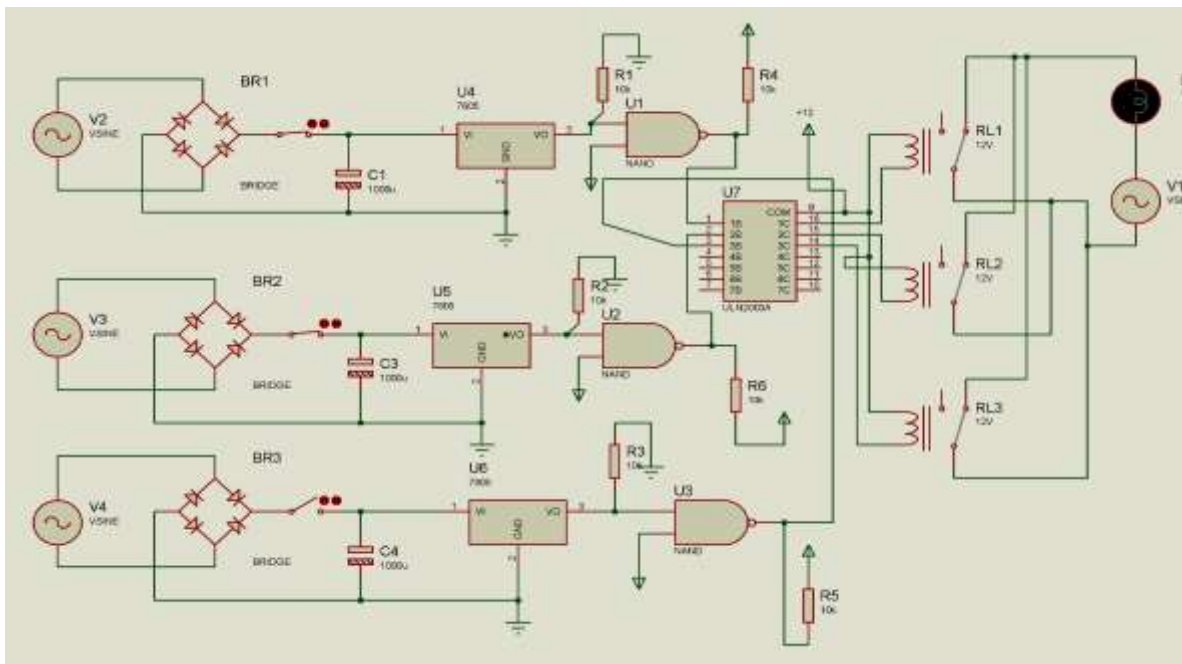
**Figure 2. Simulation of auto selection of any available phase in three phase supply system in Proteus Software**

## V. SIMULATION RESULTS

The output of simulation is as follows:

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.

## VI. CONCLUSION

The proposed system is designed to provide uninterrupted power supply to load. In this system we designed automatic phase changeover switch by using logic gates i.e. IC7400 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.

## VII. ACKNOWLEDGMENT

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