

# Design of Automatic Phase Selector from Any Available Three Phase Supply

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**ABSTRACT:** Power failure is a common problem. It hampers the production of industry, construction work of new plants and buildings. It can be overcome by using a backup power supply such as a generator. But it is cost effective 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 70% for single phase faults while other two phases are in normal condition. Thus, in any commercial or domestic power supply system where 3 phases are available, an automatic phase selector system is required for uninterrupted power to critical loads in the event of power failure in any phase. There is no requirement of backup power supply in that case. Also there is no time consumption 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 220V to 240V alternating current. Although, there are many 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 (phase selector) which is designed for only three phase A.C input power to single phase output applications.

**Key Words:** Automatic phase selector, power failure, single phase load

## 1. INTRODUCTION

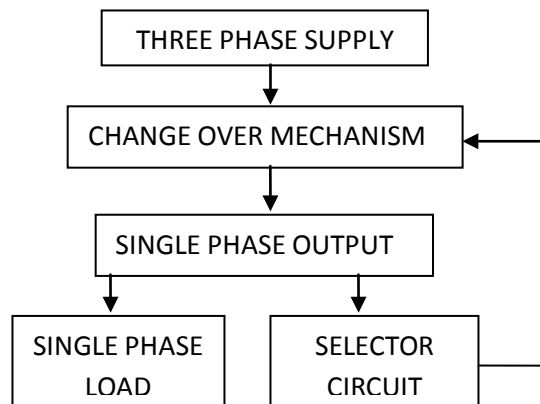
Most companies, industrial, commercial and even domestic are dependent on public power supply which has erratic supply such as phase failure, phase imbalances or total power failure due to one or more technical problem in power generation, transmission or distribution. If all the three phases are available, there is need for automation of phase change during phase failure or total power failure in any of three phases in order to safe guard consumer appliances from epileptic power supply.

In most cases, many manufacturing companies, whether they are domestic or industrial, which employ single phase equipment for its operation

sometimes experience challenges during failures in power supply. Much time would be required in the process of manual change over. This means that time and the process required for the phase change may cause serious damages to machines and even the products. Hence, there is need for automatic phase switching system.

A single phase public utility prepaid meter is operated with a single phase power supply unit. If there is a phase failure from the public utility power supply, the prepaid meter will stop working until the phase is manually changed to an active phase. So a person needs to be present always to make the changes at any point in time. To overcome this problem automatic system is required.

## 2. BLOCK DIAGRAM REPRESENTATION



According to the block diagram the three phase supply is given to the change over mechanism. The Change over mechanism consists of a conductor and a gear motor (12 V). The conductor is in touch with any of the three phases. The conductor is connected with the gear motor in such a way that if the motor moves the conductor can also move from one phase to another phase. The single phase output is first stepped down and rectified. After that it is fed to the selector circuit. This circuit selects one active phase and sends the signal to the change over mechanism which gives the single phase output connected to the load.

## 3. LIST OF EQUIPMENTS

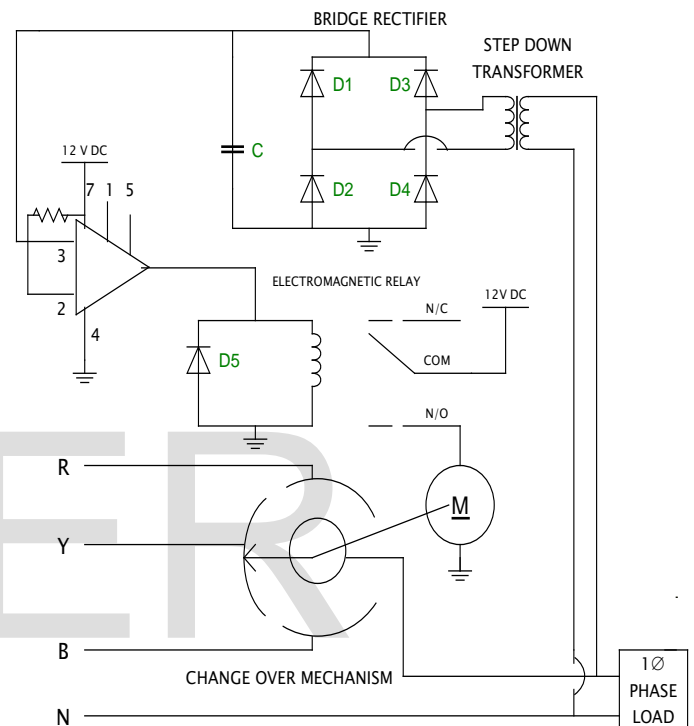
### 3.1 Electrical & Electronics Equipments:

Equipments	Rating
Transformer	500 VA, 220 V/12 V
Capacitor	100 $\mu$ F
Register	1 $\Omega$
Electromagnetic Relay	12 V
Gear Motor	12 V
Battery	12 V
Op Amp	IC 741

### 3.2 Mechanical Equipments:

Equipments	Specification
Wooden Board	12" x 16"
Aluminum Sheet	1 ft x 1 ft
Carbon brush	1" x 1/2"

## 4. CIRCUIT DIAGRAM:



## 5. OPERATION:

Automatic phase selector is applicable for a single phase load. When a three phase supply is fed to this system, it compares the voltages of each phase and active phase appears across the output. As a result an active phase is automatically selected among the three phases (R,Y,B) when one of those

phases is absent. That active phase is connected to the load. Automatic phase selector consists of a selector circuit & a change over mechanism. Selector circuit compares the voltage of each phase. The change over mechanism consists of a gear motor and one conductor. When any of the phases is absent, it gives the signal to the change over mechanism through electromagnetic relay. The gear motor starts to rotate until the conductor reaches to the next phase.

As per the circuit diagram three phase supply is given to the change over mechanism and the single phase output is taken out for supplying a single phase load. One part of this output is stepped down by a 220V/12V step down transformer. After that it is rectified by bridge rectifier and filtered by capacitor. After filtration the signal is given to pin no 3 of op-amp(IC 741), pin no 3 is already connected to a 12V DC supply. If the connected phase is active, the output of op-amp is zero. But whenever that phase is absent the output of op-amp becomes 1. The output signal is fed to an electromagnetic relay. The relay coil becomes energized and the connection changes from N/C to N/O. Thus the motor start to rotate and the carbon brush connected to the rotor shaft through a insulating material reaches to the next phase. If the next phase is active, the output of the op-amp becomes 0 again and the load can get supply from that phase as the carbon brush is in contact with that active phase. But in case if that phase is also absent, the rotor shaft with the carbon brush again reaches to the next phase. In this way we can get single phase supply continuously in spite of absence of any phase.

**6. RESULT:**

R Phase	Y Phase	B Phase	Op-Amp Output	Selected Phase
Active	Active	Active	0	Any of three ( say Y)
Active	Absent	Active	1	B
Active	Active	Absent	1	R
Absent	Active	Active	1	Y
Absent	Absent	Absent	1	None

**7. CONCLUSIONS:**

According to the result it is seen that we get the desired output from the auto phase selector. Automatically it is selecting the active phase when the connected phase is absent. The only problem is when all the three phases are not active, the motor continues to rotate and will not stop until we switch off the 12V supply of the motor manually. This problem can be overcome by implementing a timer circuit which will automatically switch off the power supply of the motor after a certain time. But our main objective is to select an active phase automatically to save the time and without hampering the work. This objective is satisfied successfully here.

**8. REFERENCES:**

[1] Ashish Kumar Gupta, Chandan Singh, Gurpreet Singh, Arun Kumar, "Automatic Cost Effective Phase Selector" International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 4, Issue 5, May 2015  
 [2] Oduobuk, E. J., Ettah, E. B., Ekpenyong, E. E., "Design and Implementation of Automatic Three Phase Changer Using LM324 Quad Integrated Circuit" International Journal of Engineering and Technology Research Vol. 2, No. 4, April 2014  
 [3] Krishan Malik, Sumit Kumar, Anil Kumar "MINOR PROJECT REPORT ON AUTOMATIC PHASE CHANGER" KURUKSHETRA UNIVERSITY, KURUKSHETRA  
 [4] Atser A. Roy, Gesa, F. Newton & Aondoakaa, I. Solomon, " Design and Implementation of a 3-Phase Automatic Power Change-over Switch" American Journal of Engineering Research (AJER), Volume-3, Issue-9,2014