

Automatic Active Phase Selector for Single Phase Load from Three Phase Supply

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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. 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 project is designed with ARDUINO. 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 present is given for LCD contrast control. This project uses regulated 12V, 500mA power supply. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer.

Keywords: Three phase supply, ARDUINO, Relay, LCD, Load.

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I. INTRODUCTION

In developing countries like India, there are 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.

II. LITERATURE SURVEY

Su Chen, GCza Jobs [1] The growing concerns regarding electric power quality and availability have lead to the investigation of solutions to eliminate or mitigate the problems created on critical loads by faults in distribution systems. Series and shunt active power conditioners have been proposed and used for this purpose. This paper discusses and compares the potential of D- STATCOMs and DVRs to provide these functions. It introduces a compensator rating factor which defines the ability of the compensator to support the load voltage in the presence of single and three phase faults. The algorithms required to carry out voltage support are derived and alternatives discussed, including the use of sequence components and direct voltage regulation.

Anu P, Divya R, Dr. Manjula G Nair [2] Most of these loads consume more reactive power and thus increases feeder losses and reduces active power flow capability of the system. In this paper, a STATCOM based controller for a three phase system feeding single phase loads is presented. The objectives of the controller in the system is to compensate the inductive loads to obtain nearly unity power factor, balance the source currents by cancelling the effect of unbalanced loads and to filter out the load harmonic currents in order to form a sinusoidal supply current. A simulation model of the system is developed in MATLAB SIMULINK and tested with linear and non-linear loads under balanced and unbalanced conditions.

L.S. Ezema, B.U. Peter, O.O. Harris [3] Power supply in Nigeria and most developing countries of the world is anything but stable. This has adverse effects on the consumers of the electricity and the equipments that are operated from the mains sources of electricity supply in these parts of the world. 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. This mechanism has been tested and we recorded a great result. It thus holds an important key in the provision of a continuous power supply through a near seamless switching between the mains supply and an alternative standby source like the generator set.

Ahmed, M.S., Mohammed, A.S., Agusiobo, O.B. [4] Phase selector is a mechanism used in alternating or switching between power phases with respect to the availability of power on any of the phases. Over the decades, there has been frequent phase failure in the power phases resulting to manual switching of the fuse from one phase to the other. However, this paper focuses on the design of a phase selector using automatic switching mechanism. This during its operation, transfers

the consumer's loads to the available power source in the case of power failure in the power supply from the national grid and automatically detects when power is restored to the failed phase and returns the loads to this source. In the course of this design, several tests were carried out such as the continuity test of contactor and relay coils to ascertain low resistance, continuity test on the contacts of the materials used to ensure free flow of current, conductivity of the wires and the whole system was also simulated using the Proteus electronics software.

III. BLOCK DIAGRAM

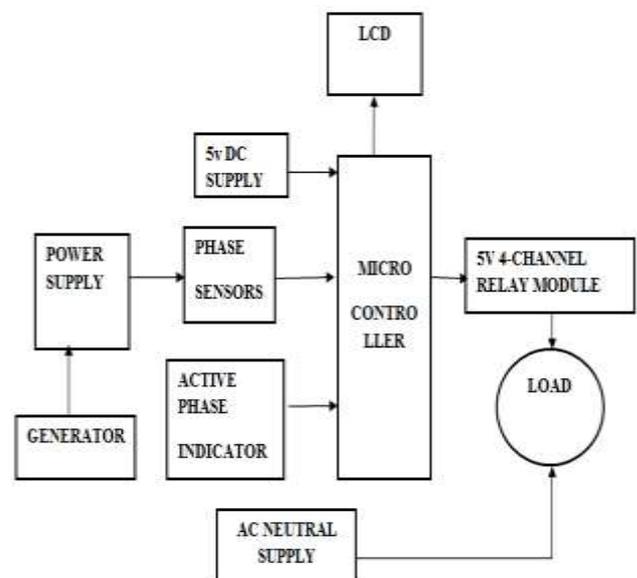


Fig 1. Block diagram

This diagram illustrates how the various modules involved in the system had been implemented. This diagram 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 system has two major parts, namely: hardware and software. The hardware architecture consists of a phase sensing, control logic, power supply, display unit, relay driver and DC relays.

The phase-sensing circuit has R, Y and B phase sensors to sense the availability of R, Y and B phase respectively. 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 display unit displays the rms voltage of the phase that is connected to the load.

Objective:

This is an arduino controller based unit and is used with three phase electrical supply. Whenever the supply of one

or two phases of a three phase electrical line goes off, the APS system automatically distributes the electrical supply from the active phase to the failed phases. This ensures continuous power supply through all the three phases even if one phase is active.

The purpose of the project is to provide the supply for the single phase load from the one of the active phase of the 3-phase supply.

This project improves reliability where continuous power supply is required.

IV. RESULT



Fig. 1 model design of proposed system

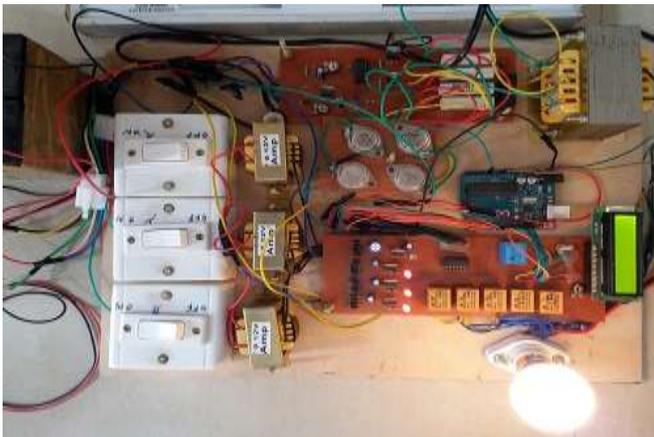


Fig. 2 all phase on and load on (R)



Fig. 3 one phase off and load on (Y)

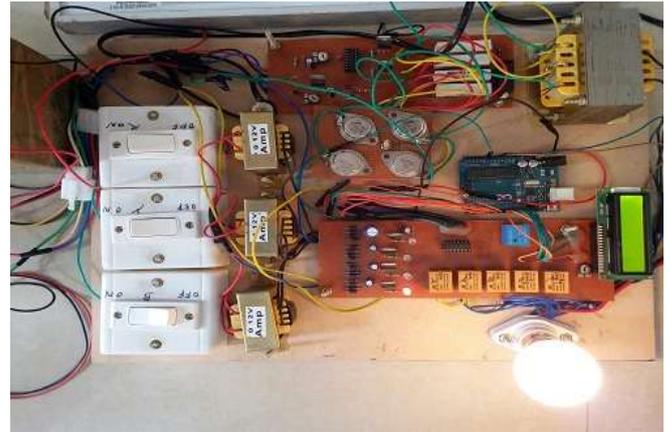


Fig. 4 two phase off and load on (B)

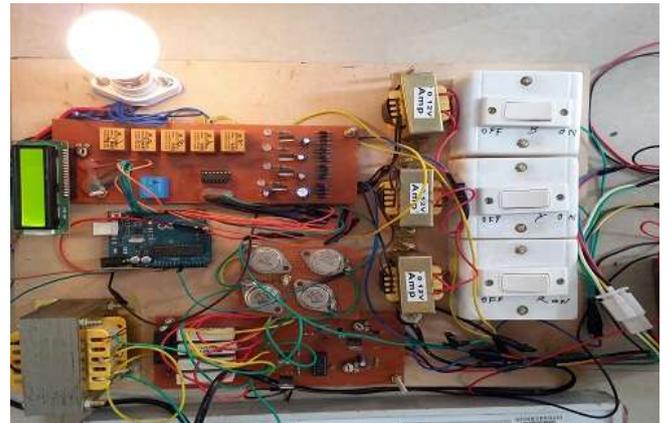


Fig. 5 all three phase off and load on via solar

V. CONCLUSION

Automatic phase Changeover is highly of great importance in Africa, to aid the automatic switching over from Generator to public power source. Changeover of this kind makes it easy for such switching to take place, and with the added advantage of being able to select between phases, Coupled to its flexibility it can be adopted in any automatic changeover circuit with ease, it is also less expensive and easily available. The most important feature of this design is that, electricity consumers in the developing countries, who suffer the challenges of power supply.

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