Controlling Power Supply Using Different Sources

Rakesh Kumar Thakur[1],Nidhi[2]andMrs. Alka Mishra*[3]
[1,2]*Scholar, Dept. of Electrical & Electronics Engineering, Bhilai Institute Of Technology, Durg*
[3]*Assistant Professor, Dept. Of Electrical & Electronics Engineering, Bhilai Institute Of Technology, Durg*

[1]*raka.8113 @gmail.com* ,[2]*nidhilodhi1996@ gmail.com and*[3]*Alkatiwari23@gmail.com*

Abstract

The main purpose of this report is to give continuous power supply using different sources like solar, mains, generator & inverter automatically. Electricity is very important in our daily life. We can't even think a second to survive without electricity. It plays a very crucial role in our life. Uninterrupted power supplies are required in houses, offices, hospitals, and large industries etc. Due to increased demand of electricity there is a requirement of alternate power supplies. This project is mainly based on microcontroller based circuits with relays to shift power supply from four different sources automatically.

Keywords – *Microcontroller, relay, uninterrupted supply*

1. Introduction

Electricity is very important in our day to day life. Electricity can be generated by coal, diesel, nuclear, etc but these can be exhausted .But we can manage our demands by using alternative sources to generate electricity. There are many non conventional sources like solar, wind, but these are costlier than conventional sources. The project is based on the idea of continuous power supply using four different sources. For this we need uninterrupted power supply. The project implements microcontroller based programming to shift different sources of electricity. In this system, weare taking four switches to establish the equivalent failure of the power supply. By pressing anyone of the switch, absence of that particular source can be obtain. The switches are connected as input to microcontroller. In this 8051 microcontroller is used. The relay driver collects output of microcontroller, which adjusts relay to maintain continuity in supply to the load. In this, we made use of GSM, which helps in operating the system from the different places. This GSM is a latest technology, which is use to collect the information about the different sources either the switch is ON or OFF.

2. LITERATURE REVIEW:

Robert Douwona [1] found out that emergency power systems were used as early as World War II on naval ships. In combat, a ship may lose the function of its steam engines which powers the steam-driven turbines for the generator. In such a case, one more diesel engines are used to drive backup generators. Early changeover switches relied on manual operation: two switches would be placed horizontally in line and the "ON" position facing each other, a rod placed in between, in order to operate the changeover switch, one source must be turned off, the rod moved to the other side and other turned on. With adequate power supply base of the nation at the moment, it is almost impossible to supply electricity to consumers at all times. The unreliable public power supply has led many to the alternative power supply sources. In Nigeria today, the use of generators to power businesses and machines have become the norm. According to the Director-General of Centre for Management Development, Dr. KabirUsman that Nigeria has the highest number of standby generators in Africa, averaging to every 2.5 people has at least one standby generator. He also pointed out that about 60million Nigerians spend 1.6trillion naira on generators annually. Many generators are in use; while some are manually started others are automatically activated. According to Jonathan [2], manual changeover switch system still remains the oldest changeover switch box used by majority of the electricity consumers. Manual changeover switch box separates the source between a generator and public supply. Whenever there is power failure, change-over is done manually by an individual and the same happens when the public power is restored. This is usually accompanied by a loud noise and electrical sparks. According to him there are some of the limitations in the manual changeover switch i.e. manual changeover is time wasting whenever there is power failure, it is strenuous to operate because a lot of energy is required, it causes device process or product damage, it has the potential to cause fire outbreak and it is usually accomplished by a lot of noise which may sometimes be psychologically destabilizing. According to Mbaocha [3], Manual changeover maintenance is frequent because the changeover action causes tear and wear. According Katz R and Boriella [4], the main advantage of the sequential logic control power changeover switch is its simplicity. According to them there are some of the disadvantages in sequential logic control system i.e. the main possible clock rate is determined by the slowest logic path in the circuit, otherwise known as the critical path. Every logical calculation, from the simplest to the most complex must be complete in one clock cycle, so logic paths that complete their calculations quickly are idle much of time, waiting for the next clock pulse. The clock signal must be distributed to every flip-flop in the circuit. As the clock is usually a high frequency signal, this distribution consumes a relatively large amount of power and dissipates much heat. Even the flip-flop that is doing nothing consumes a small amount of power, thereby generating waste heat in the chip. According to ShanmukhaNagaraj and Ramesh [5], in sequential logic control of power selection, sequential digital circuits are used to effect the detection and control of the supplied power. Sequential logic control involves only an automatic violation of the public power source in the event of power failure, but the generator activation to supply alternative power is done manually. In effect the sequential logic control is more efficient then the manual control. According Mbaocha [3], in microcontroller based controls, micro computers are employed with the resulting systems described as embedded. It gets information like data status from sensors and then issues control commands to actuators. One distinguishing feature if the embedded system from other

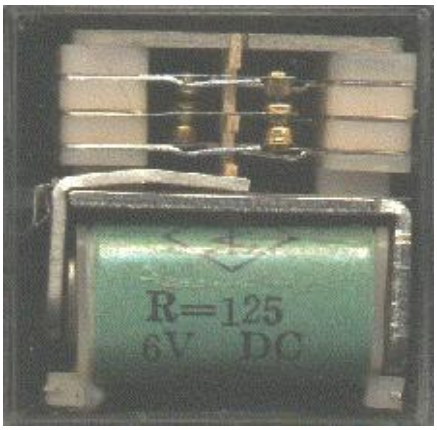
Real-time system is that they are only executing task relative to a fixed and well-defined work load. They do not provide any development environment; they are low-level programmed.

3. REVIEWS OF SYSTEM COMPONENTS

This part discusses the basic theory of components used for this work. Though, we will bemore focused on the heart of the system design (Microcontrollers) and it

3.1 Relays:

Relays are electromechanical switch used to control the electrical switches which operate in response to a signal which may be voltage, current, temperature etc. Relays operate due to magnetic fields. Copper core magnetic flux plays main role here. Relays are available for DC or AC excitation and coil voltages range from 5v to 230v.



3.2 Relay Driver UNL2803:

The Eight NPN connected Darlington transistors in this family of arrays are suited for interfacing between low logic level digital circuitry (such as TTL, CMOS or PMOS/NMOS) and the higher current/voltage requirements of lamps, relays. The ULN2803 is designed to be compatible with standard TTL families while the ULN2804 is compatible for 6v to 15v high level CMOS or PMOS.

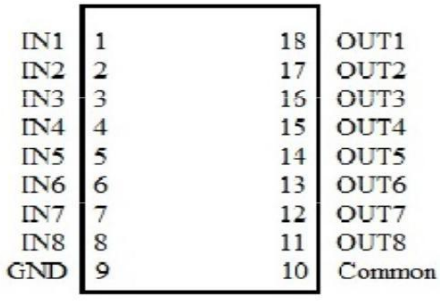


Figure: Pin Diagram (ULN2803)

3.3 Microcontroller:

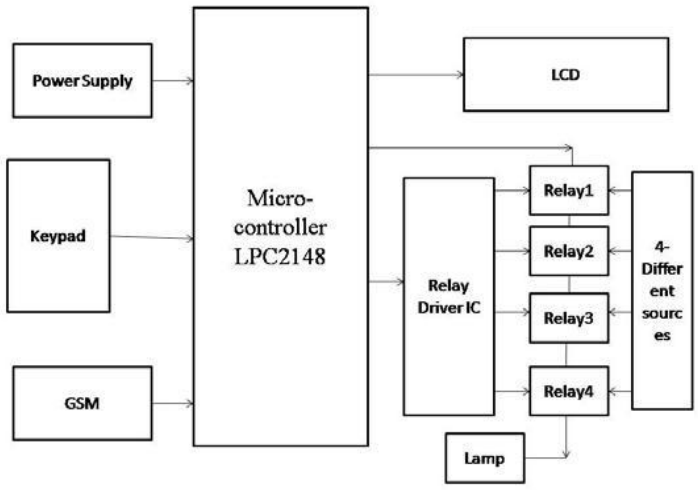
A microcontroller is a single computer chip that has capability to execute users programs. It is used for the purpose of controlling devices. It contains one or more CPUs along with memory and programmable input/output peripherals. The program can be stored within the MCU or on an Erasable Programmable Read Only Memory (EPROM). MCU are normally integrated into small devices like the microwave ovens, keyboards. The microprocessor that is universally accepted is not the same as a microcontroller. An MCU requires a small amount of computing power, less memory and a attachment accessories. MCU-based systems are reliable and cheaper and small size. It consists of a comparator which acts like an OP-AMP comparator. It has a clock that runs at a frequency of 12MHz – so chosen to make the MCU trigger faster.

3.4 Voltage Regulators:

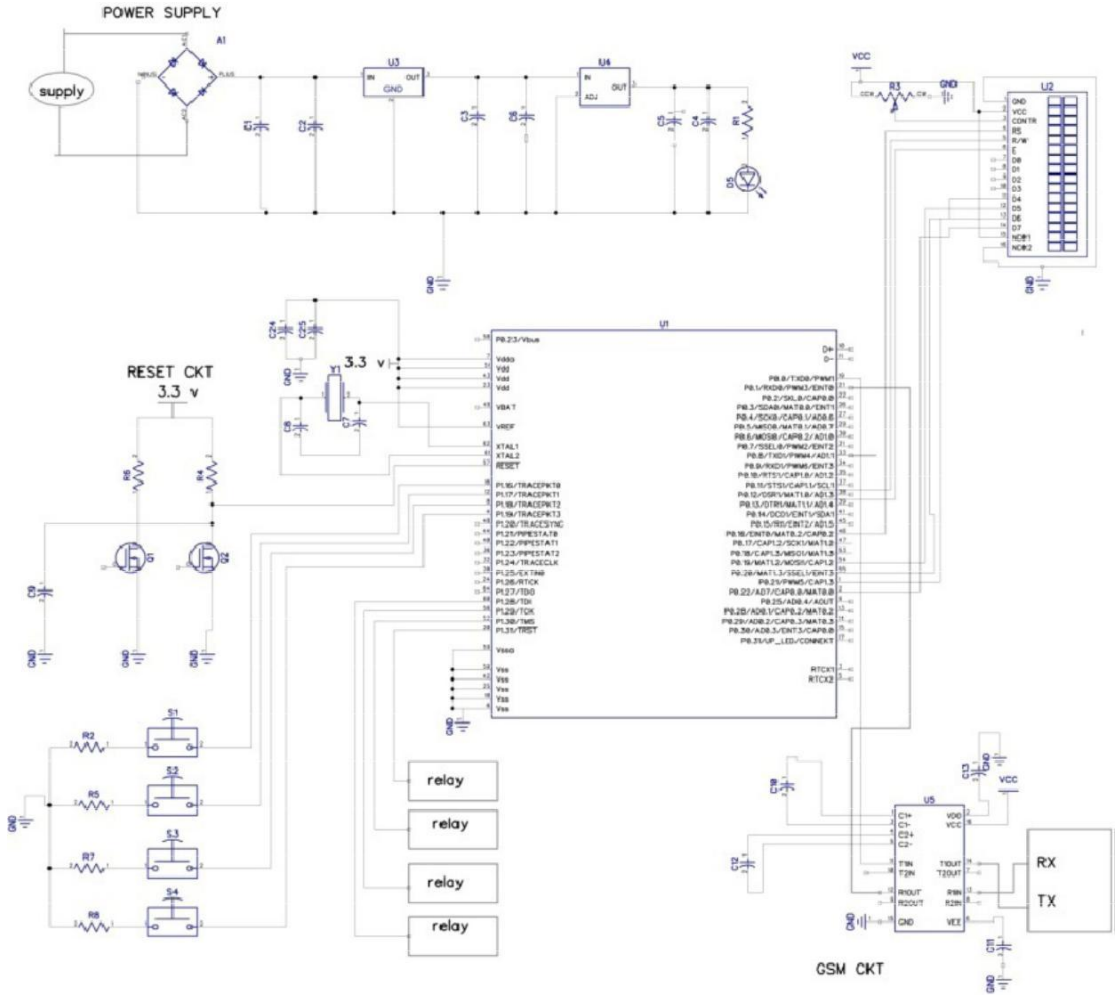
These two voltage regulators are used to give a constant DC voltage15V (LM7815) and 5V LM78L05. They act as stabilizers due to the fact that the circuit components are to run on DC voltage that contains negligible or no pulsations at all. These regulators give an unvarying output. The LM7815 uses a heat sink due to its nature to heat up. The LM78L05 however does not need a heat sink. Both the two regulators have a maximum current drawn of 1A each. The LM7815 gives an output of 15V that is fed into the comparator (LM741), though due to configurations it is not directly used as a reference voltage. The two relays RLAI and RLA2 also feed from this terminal. The LM78L05 gives an output of 5V that is fed to the microcontroller unit. This terminal must at all times have an output of 5V either from the rectified power or the battery terminal because the microcontroller oversees the general control of the whole circuit and must always be powered. This regulator is fed by a joint from two diodes (IN4001) which prevent a flow back of current and are the alternating sources of Voltagetotheregulator.

4. BLOCK DIAGRAM AND SCHEMATIC DIAGRAM:

4.1 Block diagram:



4.2 Schematic diagram:



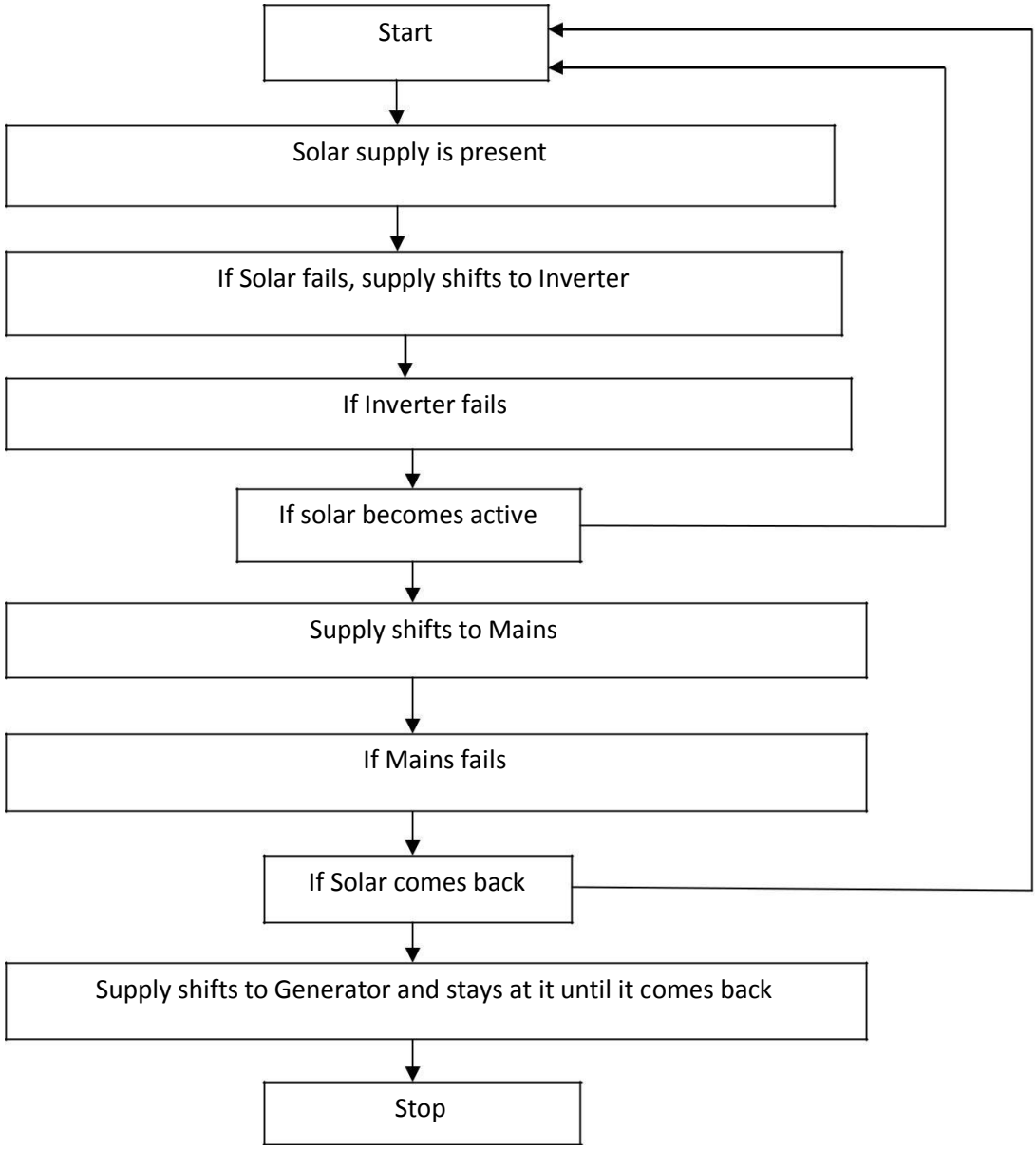
5. WORKING PRINCIPLE:

In this we are using an arrangement of four sources of supply which are channelized to a load so as to have an uninterrupted supply of load. As it is not possible to get four sources of supply such as solar, inverter main and generator. We have taken first source with solar supply and assumed as if being fed from four different sources by connecting all the four incoming sources in parallel. The ac source to the lamp is connected to four relays by making the entire open contacts parallel and all the common contacts in parallel. Four switches are used which represent failure of supply and are interfaced to the controller.

Initially we have given high input signal to the microcontroller, so as a result the controller will give a low output to activate the first relay driver which will result the relay being energized and the lamp glows. While the push button for solar is pressed that represents failure of solar supply as a result the supply is provided from the next source and the microcontroller receive high input and generates low output to activate the second relay driver

Which will result in the second relay being energized and the lamp glows.When we press the inverter button, it indicates the inverter or fails to operate and the supply comes from next source and the next source will supply high input to the controller and which will provide low signal to the third relay and the lamp switches ON and when we press the third push button the supply will chose next source now the fourth source will provide input to the microcontroller and controller activates the fourth relay and the load will get the supply and the lamp continues to glow. When all the relays are off leaving no supply to the lamp, the lamp is switched off. One 16 x 2 lines LCD is used to display the condition of the supply sources and the load on real time basis.

6. FLOW CHART:



7. CONCLUSION & FUTURE SCOPE:

In the "Controlling power supply using 4 different sources: Solar, Inverter, Generator, Mains" has been explained in this project with its features and details. The significance of this project lies in its various advantages and wide places of applications such as industries, banks, hospitals etc. It has been developed by integrating features of all the hardware components used. Presence of every module has been reasoned out and placed carefully contributing to the best working of unit.

The paper can be further enhanced by using GSM, other sources like wind power and also then taking into consideration for using the best possible power whose cost remains lowest at that moment. The significance of this paper lies in its various advantages and wide places of applications where this project can be used efficiently.

8. REFERENCES:

[1]. Robert Dowuona -Owoo-"Design and construction of three phase automatic transfer switch". A thesispresented at regent university college of science and technology Ghana(2008).

[2]. L S Ezema, B U Peter, O OHaris, - "DESIGN OF AUTOMATIC CHANGE OVER SWITCH WITH GENERATOR CONTROL MECHANISM", ISSN:2223-9944, vol 3, No 3, November 2003.

[3]. Jonathan Manually Controlled Changeover System". Vol.2, No.5. November, 2011. PP 152 – 180.

[4]. Mbaocha C. "Smart Phase Changeover Switch using AT89C52 Microcontroller". Journal of Electrical and Electronics Engineering vol.1; Issue 3.(2012)PP 31-44.

[5]. Katz R and Boriella G "Contemporary Logic Design". 2nd edition.Prentice Hall, Italy. (2005) PP 445-589.

[6].ShanmukhaNagaraj and Ramesh S "Programmable Logic Controlled Circuits. International Journal of Research in Engineering and Technology Vol.1, issue 2, July 2013; PP 111-116.

[7]. L.S. Ezema, B.U. Peter, O.O. Harris"Design of Automatic Change Over Switch With Generator Control Mechanism". Electrical Power and Electronic Development Department, Projects Development Institute (PRODA), Enugu: Natural and Applied Science, Vol.3, No.3, November, 2012. PP 125 –130

[8]. AntonisPotrikis,KostasKalaitzakis "Methodology for optimal sizing of standalone photo voltaic[4/wind generators system using genetic algorithm",1072-1088, doi:10.1016/j.(2006)

[9]. Aaron M. Jungreis, Cary,"UNINTERRUPTIBLE POWER SUPPLY", United States Patent, Patent N0.: US 6,184,593 B1,(2001)

[10].NafahE.M,NgudamJ.M., TchindaR "Modelling of solar/diesel/battery hybrid power systems for far North Cameroon", 832-844, doi:10.1016.(2007).