

Auto Power Supply System Using 4 Different Sources

Atul Singh¹, Aniket Patode², Shweta Sonawane³, Sneha Sonawane⁴, Prof. Sarita Bopalkar⁴
^{1,2,3,4}*Department of Electrical Engineering, Smt. Indira Gandhi College of Engineering, Navi Mumbai, Maharashtra*

Abstract-This project is designed to automatically supply continuous power to a load through one of the four sources of supply that are: solar, mains, thermal, and wind when any one of them is unavailable. The four switches represent the four causes. The switches are connected to an 8051 microcontroller of which they provide input signals. Whenever a switch is pressed, it shows the absence of that particular reference. A relay driver is used that receives microcontroller generated output and switches that specific relay to provide continuous power supply. A lamp or bulb is used as a load for demonstration purpose which draws power from main. When the primary fails to supply power, automatically next available source is used like thermal. If thermal fails then the next one is used and so on. An LCD is used to show which power supply is on. This project is designed to automatically supply continuous power to a load through one of the four sources of supply that are: Mains, Inverter, Generator, and Solar when any one of them is unavailable. The demand for electricity is increasing everyday and frequent power cuts is causing many problems in various areas. There should be option for an alternative arrangement of power supply. A microcontroller of PIC 16 is used. The output of microcontroller is given to the relay driver which switches the appropriate relay to maintain uninterrupted supply to the Load.

Keywords:-PIC16 Microcontroller, Relay Driver, Solar, LCD, Battery, Programming.

INTRODUCTION

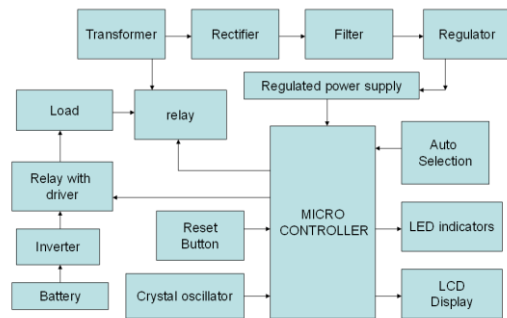
The main scope of this project is to ensure the consumption of the power supply from mains, inverter, Generator and solar sources, optimally by using an appropriate programmed microcontroller in the most effective way. Emergency power systems are the types of systems that may include lighting, fuel cells and other apparatus, to provide backup power resources in crisis or when the regular systems fail. They find uses in a wide variety of settings from residential homes to hospitals, scientific laboratories, data centers, telecommunication equipment and modern naval ships. Some homebrew emergency power systems

use regular lead-acid based car batteries. Reduction of the system's power consumption extends the battery life, reduces system temperature and the system's fan noise as well. The Power consumption can be greatly improved from a stock distribution configuration to a fine-tuned system. The main objective of this project is to provide uninterrupted power supply to a load, by selecting the supply from any source out of 4 such sources: mains, inverter, Generator and solar sources, automatically in the absence of any of the source. In this commands of the microcontroller are fed to the relay driver IC, which switches appropriate relay to maintain uninterrupted supply to the load. It is indicated by using a lamp which fed through a single power supply from the mains initially. On the failure of this mains supply which has been actuated by pressing the appropriate switch, the load gets supply from the next available source – for instance, an inverter. If the inverter also fails, it switches over to the next available source, and likewise. As it is not feasible to provide all the 4 different sources of supply as indicated in the block diagram. Therefore it automatically switches to next sources as the priority. Different peoples and companies are working on this auto power supply control system which are making this system with the help of magnetic contactors and power relays but their system is so must costly and do not provide precise uninterruptible power supply.

This setup can be further enhanced by using other sources like wind power and also by taking into consideration the best possible alternative power source whose tariff remains lowest at any given time.

Overview of Components.

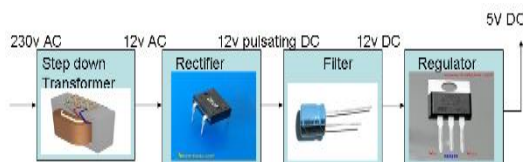
The block diagram of the project and design aspect of independent modules are considered.



Major blocks:

1. Regulated Power Supply
2. Crystal oscillator.
3. Transformers
4. Micro Controller
5. Relays with diver
6. LCD

Regulated Power Supply:



Transformer:-

Transformer is a electromagnetic device which induces the voltage due to magnetic field present between primary and secondary windings.

It has two windings called as primary winding and secondary winding. We are giving input 230v input voltage at primary side. The output of transformer is 12v

In this project we are using 12v step down transformer.

Rectifier:-

Rectifier is circuit which converts the ac in to dc. We have two types of rectifier.

- 1.Full wave rectifier
- 2.Half wave rectifier

In this project we are using bridge rectifier because the efficiency of the bridge rectifier is high compare to all rectifiers.

Filter:-

The output of rectifier is not pure DC. It may contain some ripple components that is pulsating DC.

To eliminate this ripple components which are present in output we are using filter.

Filter is a circuit which is used to eliminate the ripples present in rectified output.

Regulator:-

The output of filter is not constant output voltage it will varies according to changes in input but we want constant output voltage. For this purpose we are using voltage regulator.

Regulator is defined as it is a device which will maintain constant output irrespective of changes in input.

We are using 7805 voltage regulator to maintain constant 5v output voltage irrespective of changes in input voltage.

Microcontroller:-

A microcontroller is a small computer on a single integrated circuit consisting of a relatively simple CPU combined with support functions such as a crystal oscillator, timers, watchdog timer, serial and analog I/O etc.

Microcontrollers are also used in scientific, high technology, and aerospace projects.

In this project we have used PIC 16F72 microcontroller.

Crystal Oscillator:-

An oscillator is an electronic circuit that produces a repetitive electronic signal.

The maximum operating frequency of PIC Microcontrollers is 20 MHz.

Crystal oscillator is used in the project because of the fact that crystal is more stable to temperature than other types of oscillators.

Relay:-

Relay is an electromagnetic switch. . It consists of a coil of wire surrounding a soft iron core, an iron yoke, which provides a low reluctance path for magnetic flux, a movable iron armature, and a set, or sets, of contacts; two in the relay pictured. The armature is hinged to the yoke and mechanically linked to a moving contact or contacts.

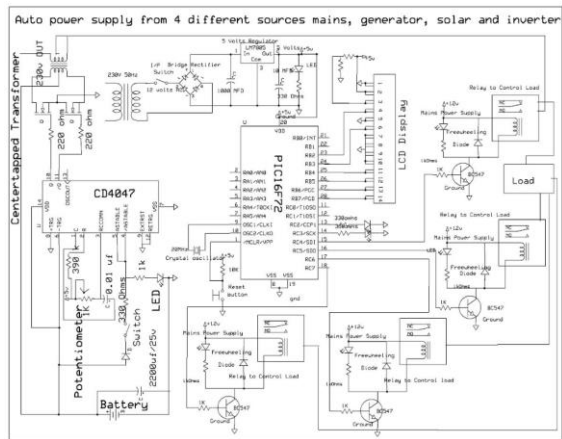
LCD Display:-

A liquid crystal display (LCD) is a thin, flat electronic visual display that uses the light modulating properties of liquid crystals.

We have used 16x2 LCD display.

These are used in a wide range of applications, including computer monitors, television, instrument panels, aircraft, cockpit displays, signage, etc

Circuit Diagram:-



Working of Project:

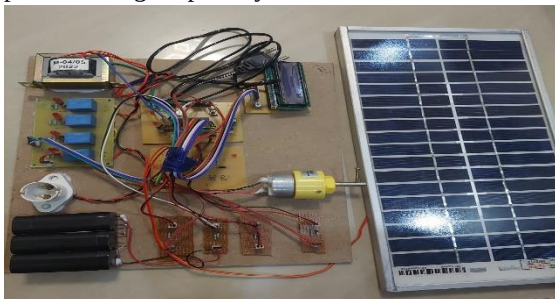
Initially Main Supply is on so all other power sources will be off as Main supply given to the main priority.

As soon as main turns off or power cuts off, Inverter Supply will automatically be selected and the system will run on Inverter Supply.

Now if Main as well as Inverter Supply are not available, then Solar is automatically selected and the system runs on Solar Supply.

Finally, if Main Supply, Inverter Supply, and Solar Supply are not available, then the system will automatically switch to Generator and will run on the same.

Now amongst all these above-mentioned sources, if any of the source of higher priority comes back, then the system will automatically switch to that particular higher priority source.



Software's used:

1. PIC-C compiler for Embedded C programming.
2. PIC kit 2 programmer for dumping code into Micro controller.
3. Express SCH for Circuit design.
4. Proteus for hardware simulation.

ADVANTAGES:-

- It is user-friendly.
- Safer to use.

- Reduces the time of switching due to automation.
- Requires least maintenance.
- It does not cause any environmental pollution like the fossil fuels and nuclear power.
- Utilization of free available source of energy from sun.
- By this project automatically ups system is turn on and turn off whenever the power is off and power is on respectively

DISADVANTAGES:

- The electricity generated by the solar cell panel is stored during the day with the help of storage batteries which give us only direct current.
- But to operate our devices we need alternating current. Therefore we need to convert DC to AC before using any appliance and thus it increases the cost of such solar panels as the sources of electricity
- Cost of equipments is high.

APPLICATIONS:

1. This system could be used in that places where we have different sources of supply such as solar, main and generator.
2. This system could be used in industries for supplying the uninterruptable power supply to the industrial machines.
3. This system could be used in educational institutes and hospitals for supplying the uninterruptable power supply to the hospital or educational equipment.

This system is more compact and reliable

CONCLUSION

We conclude that main objective of this project is to develop an "auto power supply control system from 4 different sources: Mains, Inverter, Generator & Solar.

It has been developed by integrating features of all the hardware components used presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit.

FUTURE SCOPE

The main scope of this project is to ensure the consumption of the power supply from mains, inverter, generator and solar sources, optimally by

using an appropriate programmed microcontroller in the most effective way.

Emergency power systems are the types of systems that may include lighting, generators, fuel cells and other apparatus, to provide backup power resources in crisis or when the regular systems fail.

This setup can be further enhanced by using other sources like wind power and also by taking into consideration the best possible alternative power source whose tariff remains lowest at any given time.

REFERENCE

The sites which were used while doing this project:

1. www.wikipedia.com
2. www.allaboutcircuits.com
3. www.microchip.com
4. www.howstuffworks.com

Books referred:

1. Raj kamal –Microcontrollers Architecture, Programming, Interfacing and System Design.
2. Mazidi and Mazidi –Embedded Systems.
3. PCB Design Tutorial –David.L.Jones.
4. PIC16F72 Microcontroller Manual – Microchip.
5. Embedded C –Michael.J.Pont.