

Uninterrupted Power Supply to a Load using Auto-Selection between Four Different Source

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Abstract

In present time's electric supply is very essential to the human beings. Uninterrupted power supplies are needed in almost all of the areas in our life-in household applications, research institutions, hospitals etc. Due to the increased demand of power and large consumption of conventional energy sources, which are limited in nature, there is a need to shift from conventional methods of energy production to a better approach using hybrid systems to economically use the conventional and non-conventional sources. This project deals with the automation of switching between different sources so as to get uninterrupted power supply and that to at low economical cost. Multiple sources increase the reliability of the system and the system is more robust to power failures and faults.

The project implements micro controller based circuit with relays to facilitate automatic prudent shift of power supply from the various available sources.

Date of Submission: 24-05-2023

Date of acceptance: 05-06-2023

I. INTRODUCTION

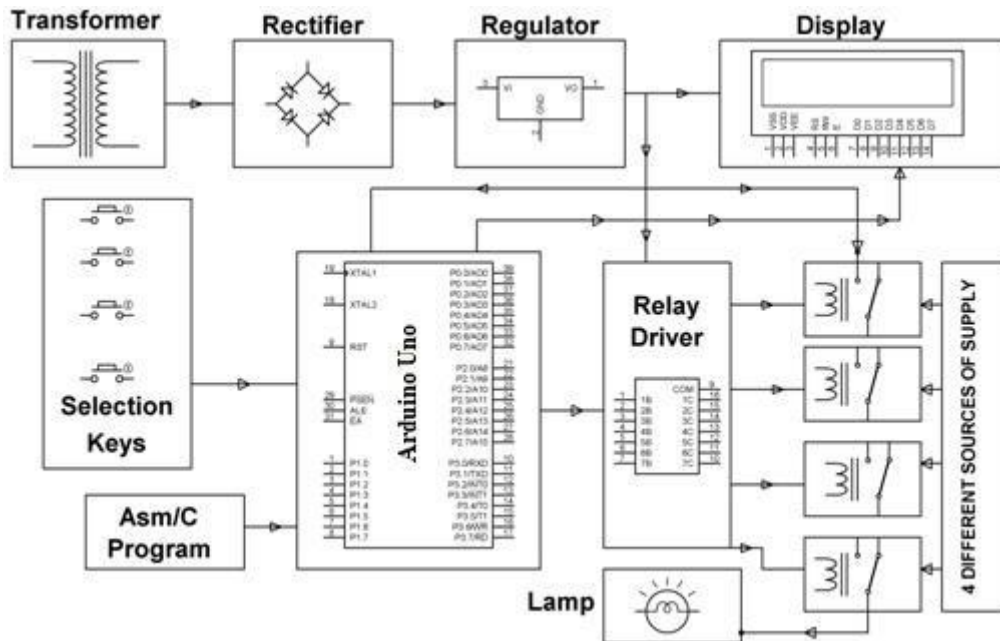
The project is designed to automatically supply continuous power to a load through one of the four sources of supply that are: solar, mains, generator, and inverter when any one of them is unavailable. Four switches are used for four respective sources. These are connected to a microcontroller of Arduino Uno family that provides input signals to it. Whenever a switch is pressed it shows the absence of that particular source. A relay driver is used that receives microcontroller generated output and switches that particular relay to provide continuous power supply. A lamp is used as a load for demonstration purpose which draws power from main. When main fails to supply power, automatically next available source is used say inverter. If inverter fails then the next one is used and so on. An LCD is also used to display which source is being currently used for power supply. Therefore, this project provides an effective solution to provide an alternative power supply during frequent power cuts.

In this project uses four switches to demonstrate the respective failure of that power supply. When any of the switches is pressed it shows the absence of that particular source, switches are connected to microcontroller as input signals. A microcontroller of Arduino Uno family is used. The output of microcontroller is given to the relay driver IC, which switches appropriate relay to maintain uninterrupted supply to the load. The output shall be observed using a lamp drawing power supply from mains initially. On failure of the mains supply (which is actuated by pressing the appropriate switch) the load gets supply from the next available source, say an inverter. If the inverter also fails it switches over to the next available source and so on. The current status, as to which source supplies the load is also displayed on an LCD. As it is not feasible to provide all 4 different sources of supply, one source with alternate switches are provided to get the same function.

The problems like power outages, unexpected routine line maintenance and power interrupts are increasing day by day. So, to overcome from these problems, this system provides an continuous power supply. In this system renewable energy sources are used along with system microcontroller ATMEGA16, which is advanced in many ways then the 8051 microcontroller.

System also consist of LCD display is used which gives updated status regarding the working of the system. Overall working of the system is totally automated. System aims at to avoid manualinteraction.

Block Diagram



Block Diagram

Block Diagram Description 1. Arduino Uno

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo.

The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available.

2. Crystal Oscillator

A crystal oscillator is an electronic oscillator circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a constant frequency.

3. Transistor

The transistor is a semiconductor device which transfers a weak signal from low resistance circuit to high resistance circuit In other words, it is a switching device which regulates and amplify the electrical signal likes voltage or current. The transistor consists two PN diode connected back to back.

4. Dc Adapter

Originally, most AC/DC adapters were linear power supplies, containing a transformer to convert the mains electricity voltage to a lower voltage, a rectifier to convert it to pulsating DC, and a filter to smooth the pulsating waveform to DC, with residual ripple variations small enough to leave the powered device.

5. Relay

A relay is an electromagnetic switch operated by a relatively small electric current that can turn on or off a much larger electric current. The heart of a relay is an electromagnet (a coil of wire that becomes a temporary magnet when electricity flows through it).

6. PCB's Board

A printed circuit board (PCB) mechanically supports and electrically connects electrical or electronic components using conductive tracks, pads and other features etched from one or more sheet layers of copper laminated onto and/or between sheet layers of a non-conductive substrate.

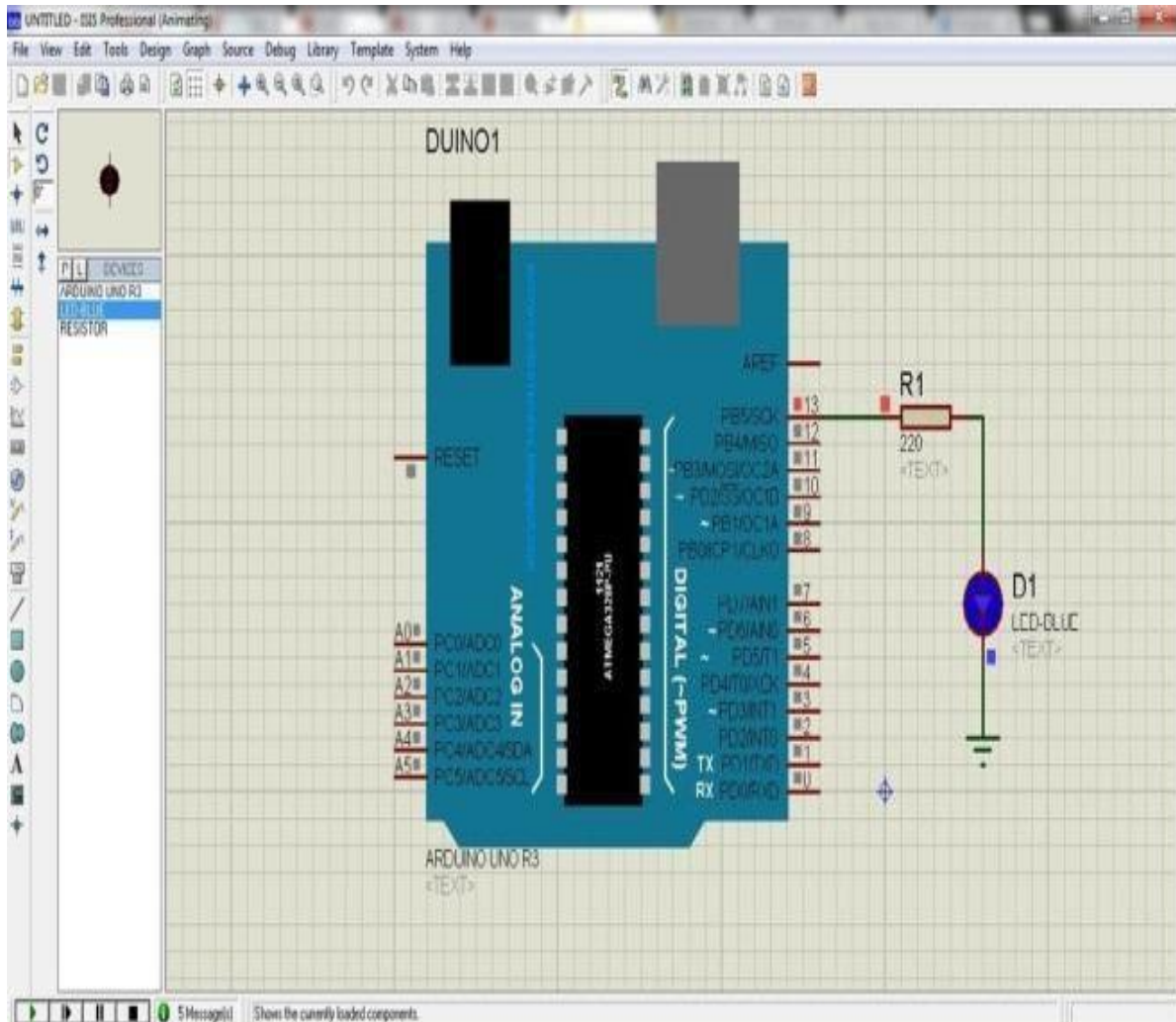
Proteus Ide Software

Proteus is simulation software for design with a microcontroller. It is easy to handle and test. After creating a circuit in Proteus software can easily make the PCB design with it.

HI-TECH compiler offers a complete ANSI C an embedded package with a full development system for language C and assembler. Here HI-TECH compiler is used to compile the code.

C LANGUAGE C language is High-level language and most commonly used programming language.

Reasons used for C language 1. Easy to understand 2. Various computer platforms can be used to compile the C program.

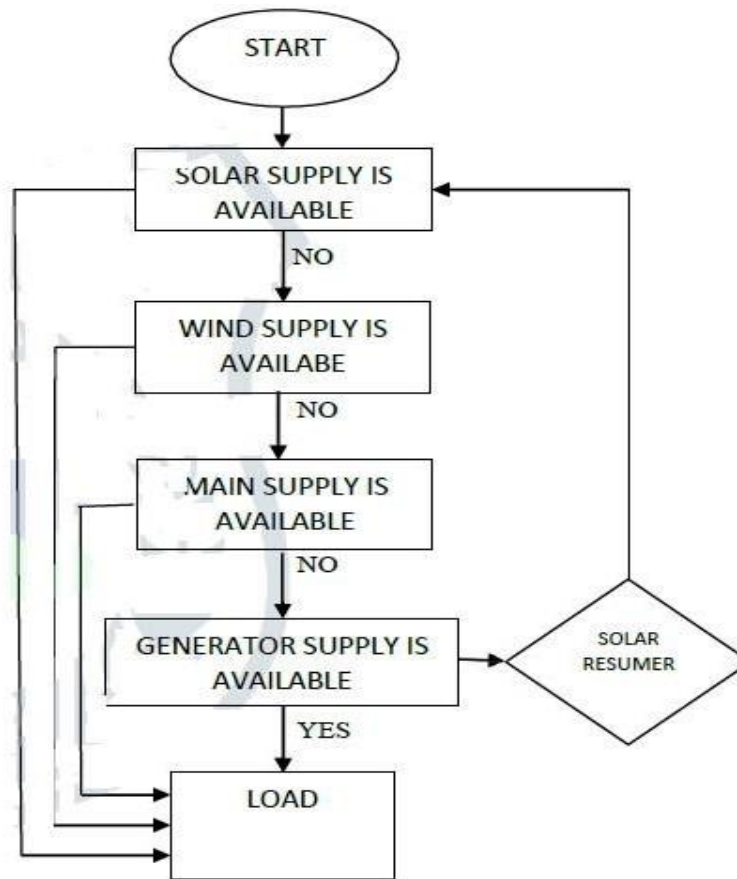


II. Results and Discussion

The demand of energy worldwide grows rapidly, because energy generation is low but energy consumption is on a high rate. Electricity companies cannot satisfy the demand and must use nonconventional energy system. Use of renewable energy along with the non-conventional sources not only increases the reliability of the system but also allows higher power demands to be fed.

Prioritizing the various available sources makes the selection and utilization economic. The priorities may be decided according to the availability of source, usage cost, its effects on the operation of other equipment (noise due to generators, smokes etc). The selection algorithm can be coded into a microcontroller which will automatically shift between different sources using relays through the relay driver. The project involves four different sources with different parameters to allow microcontroller to judge the selection of best available source to use.

Flow Diagram



III. CONCLUSION

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