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Automatic Power Supply Control to Ensure No Break Power

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ABSTRACT

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 different sources such as mains, generator, and inverter and solar automatically in the absence of any of the source. As we know that the demand for electricity is increasing every day and frequent power cuts is causing many problems in various areas like industries, hospitals, offices and houses which are necessary to be prevented. An alternative arrangement for power source must be used. This project uses four switches to demonstrate the respective failure of that source of supply. A microcontroller of ATmega328 family is used. The output of the microcontroller is given to the relay driver IC, which switches appropriate relay to maintain an uninterrupted supply to the load. When any of the switches is pressed it shows the absence of that particular source. Switches are connected to microcontroller as input signals. The output is 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 to 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.

Keywords: Power supply block**,** Microcontroller (ATMEGA328p), Relays, LCD, Resistor, Capacitors.

I. INTRODUCTION

The auto power supply control system is very convenient system for that consumers who want to attains uninterruptible power supply from different sources such as solar, main, generator and inverter. If we see it at commercial level, then we can estimate that there are so many consumers or customers which have the equipment or machines whose requirements is only uninterruptable power supply. Such as the data base companies whose all work is done on computer then it is required an uninterruptable power supply all the time, otherwise their computer could be off during the time when the load is shifted on another source, similarly the companies which have the data base production machines then it also could be also off during the load shifted then their production can be stop or damage. Concentrating on these above problems we can examine the importance of this auto power supply control system in this modern world. 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 much costly and do not provide precise uninterruptible power supply. Here we are making this auto power supply control system with the help of power electronics components, microcontroller ATmega328p and electronic relays.

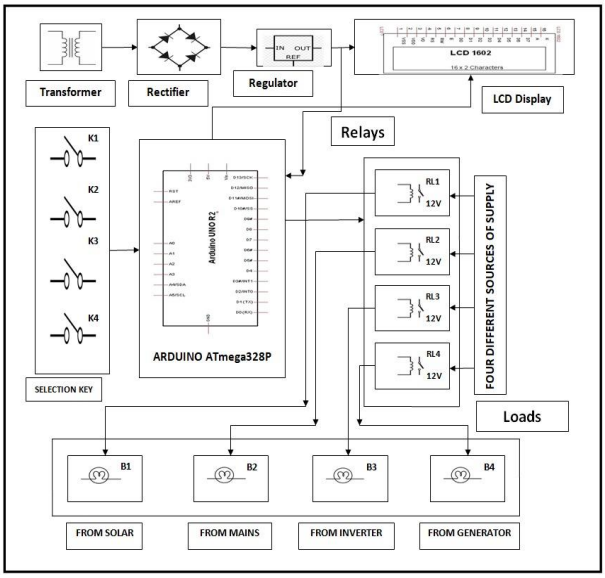
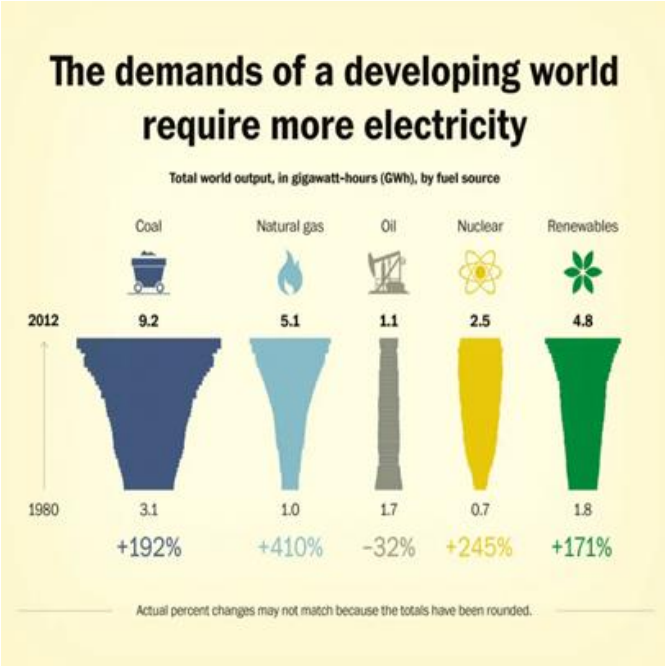


Fig.1 Block Diagram Auto Power Supply

II. DESCRIPTION



Of the world's 1.3 billion people who live without access to power, a quarter — about 300 million — live in rural India in states such as Bihar. Nighttime satellite images of the sprawling subcontinent show the story: Vast swaths of the country still lie in darkness.

"It's a matter of shame that 68 years after independence we have not been able to provide a basic amenity like electricity," -Piyush Goyal, India's minister of state for power, coal and new and renewable energy, said recently. The Indian government has launched an ambitious project to supply 24-hour power to its towns and villages by 2022 — with plans for miles of new feeder lines, infrastructure upgrades and solar micro-grids for the remotest areas.

Although 300 million Indians have no access to power, millions more in the country of 1.2 billion people live with spotty supplies of electricity from the country's unreliable power grid. The grid failed spectacularly in 2012, plunging more than 600 million people into total blackout. In the country's high-tech capital of Bangalore, for example, residents have recently had to endure hours of power outages each day after repairs and a bad monsoon season prevented the state's hydro-electric and wind power plants from generating enough electricity. Many of the giant IT companies have their own generating systems — Infosys, for example, is building its own solar park — but small businesses and residents in rural and urban areas are suffering, said Harish Hande, the chairman

of Selco-India, a social enterprise that provides solar power in Karnataka.

"How do we manage our supply and make sure we put money aside for infrastructure? If you look at the future, it's what we need," he said, "but there's not a single thing that's moving ahead." Estimates show that India's power woes cost the economy anywhere from 1 to 3 percent of gross domestic product — an impediment to Modi's hopes to expand the economy and make the country more hospitable to manufacturing, according to Rahul Tongia, a fellow with Brookings India. Electricity demand will increase sevenfold by mid-century as the population continues to grow, experts say.

Energy access is worse in rural areas. Bihar, one of India's poorest states, has a population of 103 million, nearly a third the size of the United States. Fewer have electricity as the primary source of lighting there than in any other place in India, just over 16 percent, according to 2011 census data. Families still light their homes with kerosene lamps and cook on clay stoves with cow- dung patties or kindling. In recent months, the Indian government has announced plans to modernize its national grid and is preparing to address the financial woes of the country's state-owned utility companies, some of which are mired in debt, to the tune of $66 billion. The rescue plan is likely to include power tariff hikes — a politically unpopular concept in a country where many residents are used to heavily subsidized power. In 2010, according to a World Bank estimate, 87 percent of all electricity consumed by domestic customers was subsidized.

Our system integrates the following components in the design: Power supply block, Ardiono UNO (ATmega328p),LCD, BC547 Transistors, Resistor, Capacitors. The system was designed and simulated using auto power supply control system is very convenient system for that consumers who want to attains uninterruptible power supply from different sources such as solar, main, generator and inverter . As it is not feasible to provide all the 4 different sources of supply, one source with alternative switches are provided to get the same function. In this project we are having 4 switches which are consider as 4 different sources of supply. When we press any of the switches it shows the absence of the particular source which is connected to microcontroller as input signals.

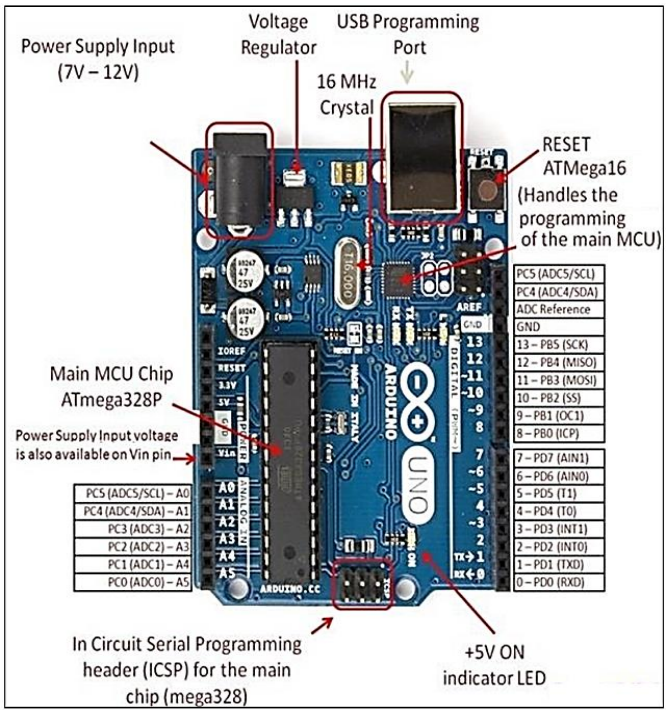


Fig.2 Pin diagram of ARDUINO.

The board has 14 Digital pins and 6 Analog pins. It is programmable with the Embedded C.

The figure above shows the pin diagram of arduino.

LED: There is a built-in LED driven by digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.

VIN: The input voltage to the Arduino/Genuino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.

5V: This pin outputs a regulated 5V from the regulator on the board. The board can be supplied

with power either from the DC power jack (7 - 20V), the USB connector (5V), or the VIN pin of the board (7-20V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage the board.

3V3: A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.

GND: Ground pins.

IORef: This pin on the Arduino/Genuino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs to work with the 5V or 3.3V.

Reset: Typically used to add a reset button to shields which block the one on the board.

Serial: pins 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.

External Interrupts: pins 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.

PWM(Pulse Width Modulation) 3, 5, 6, 9, 10, and 11 Can provide 8-bit PWM output with the analogWrite() function.

SPI(Serial Peripheral Interface): 10 (SS), 11 (MOSI),

12 (MISO), 13 (SCK). These pins support SPI communication using the SPI library.

TWI(Two Wire Interface): A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library.

AREF(Analog Reference: Reference voltage for the analog inputs.

LCD Display Unit:

LCD display is used for displaying the message sent from the remote location. The LCD module (Fig. 5) displays alphanumeric, kana (Japanese characters) and symbols. It consists of 16 pins (8 data lines, 3 control lines, 2 power lines, 1 contrast line and 2 pins for back light LED connection). Data line and control line are connected to the microcontroller. The LCD display power rating is as stated below:

Current (IDD) $(VDD{=}5.0v)$……1.0mA – 3.0mA max

Range of $VDD–V0$……1.5~5.25V or 5.0±0.25

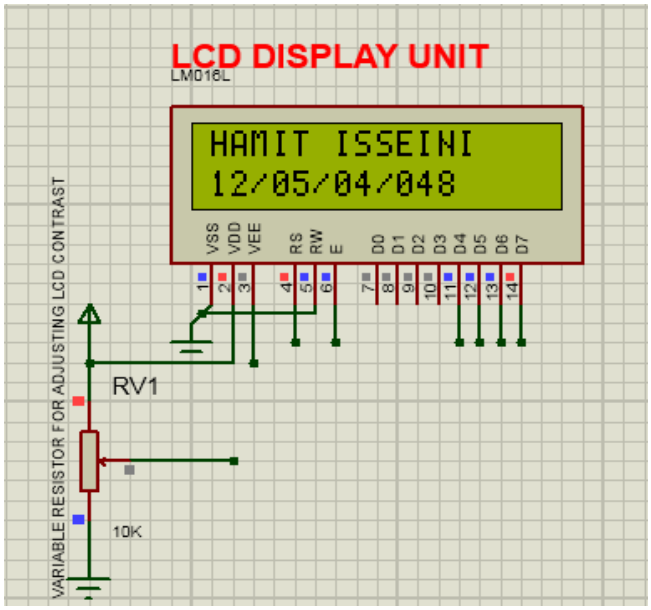


Fig.3 LCD Display Unit

III. SYSTEM DESCRIPTION

This project uses an arrangement of 4 different sources of supply which are channelized to a load so as to have an uninterrupted operation of the load. As it is not practicable to get 4 sources of supply such as mains supply, generator supply, inverter supply and solar supply, we used one source and a set of relays. We have taken first source with mains supply and assumed as if being fed from 4 different sources by connecting all the 4 incoming sources in parallel. The ac source to the lamp is connected to four relays by making the entire normally open contacts parallel and all the common contacts in parallel. 4 push button switches are used which represent failure of corresponding supply respectively and are interfaced to the controller. Initially we have given high input

signal to the microcontroller, so as a result the controller generates a low output to activate the first relay driver which will result in the relay being energized and the lamp glows. While the push button for mains is pressed that represents failure of mains 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 generator button, it indicates the generator fails to operate and the supply comes from the 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.

A. SOFTWARE IMPLEMENTATION:

The software design consists of a free running program by using aurdino UNO ATMEGA328P.

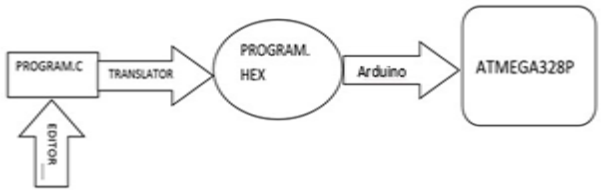


Fig..4 Device Programming

B. CIRCUIT DIAGRAM COMPONENTS:

1.Bridge Rectifier:

A bridge rectifier is commonly used in electronic devices. It converts AC to DC which takes AC input and gives the DC-output.

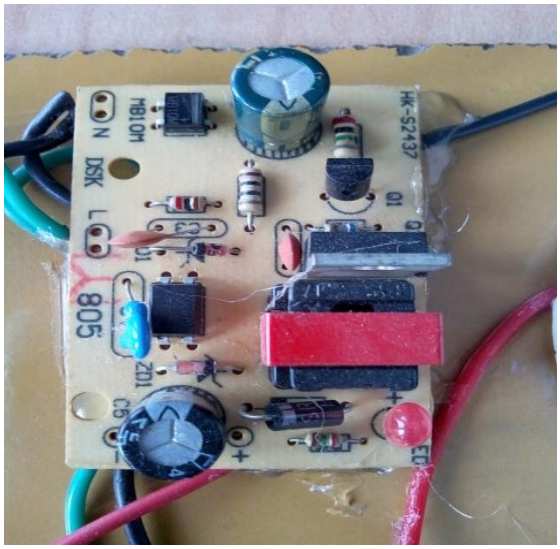


Fig.5 Bridge Rectifier

2.Voltage Regulator:

A Voltage regulator is designed to automatically and maintain a constant voltage level, It may be a simple - Feed forward design or may include negative feedback control loops. It may use an electromechanical mechanism or electronic components, It will depend upon design, It may be used to regulate one or more AC or DC voltages.

3.Embedded System:

A combination of hardware and software which together form a component of a large machine. An example of an embedded system is a microprocessor that controls an automobile engine.

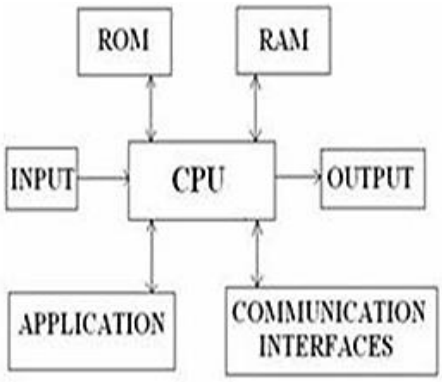
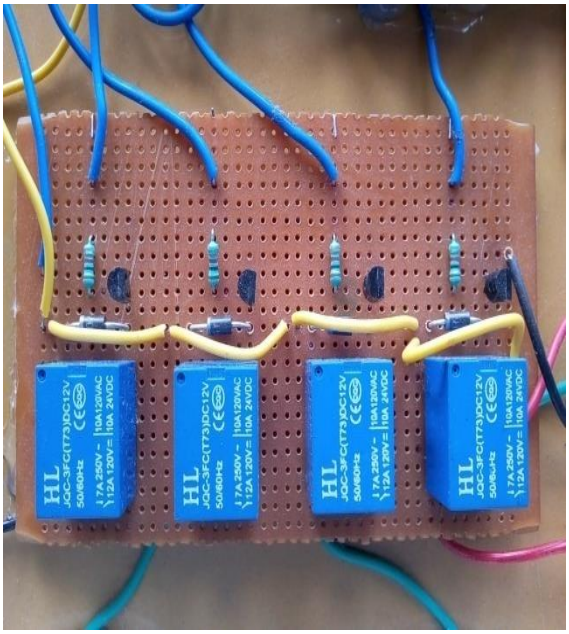


Fig.6 Embedded System

4.Relay:

It is an electromagnetic switch used to control the electrical devices. Copper core magnetic flux plays an important role.



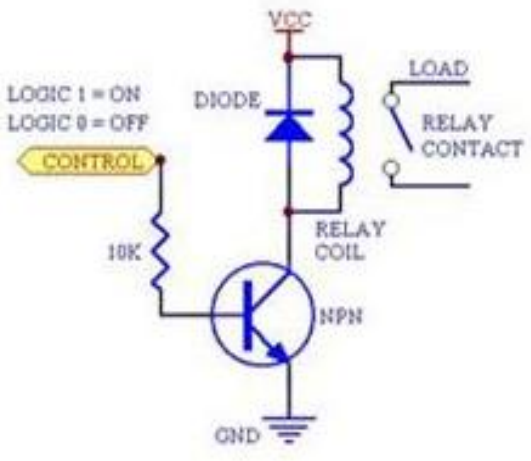


Fig 7. Relay

IV. RESULTS AND DISCUSSION

Therefore, we obtained the uninterrupted power supply from four different sources using Arduino in accordance with programme in Arduino.

Fig.8 Output

The main scope of this project is to provide a continuous power supply to the output load through any of the sources from which we are operating the device, i.e., generator, and inverter and solar automatically in the absence of any of the source. The complete operation of this project is based on the microcontroller. This project is a low-cost, reliable, effective and efficient system. This project gave us confidence and practical knowledge and makes us to learn about good things.

V. ACKNOWLEDGMENT

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