MULTISOURCE POWER SUPPLY WITH NO BREAK TECHNIQUE USING ARDUINO MICROCONTROLLER

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Abstract : The demand for electricity is increasing every day and frequent power cuts is causing many problems in various areas like industries, hospitals and houses. An alternative arrangement for power source is a must. The project can be further enhanced by using other sources like solar power also and then taking into consideration for using the best possible power whose tariff remains lowest at that moment. Power is most important requirement for all of us. We know that due to large demand of electricity and due to limit capacity of power plant at generating station, power cut off is common for all us. Due to limited amount of power generation at power station and due to shortage of non-renewable continuous supply source it beings a biggest challenge in whole world. If you see all around us you will observe that due to discontinuity of power supply, many problems have been faced by people in their everyday use. This type of power failure create problem for data centers, hospitals and some research work. This is the biggest reason that every countries are researching for the work to supply a continuous power with good efficiency and with good regulation. In this project we can combine the renewable and non-renewable energy sources to get the continuous power supply such as solar, mains, inverter and generator. The power cut of these sources can be automatically done by arduino microcontroller. The continuous supply to load can be given by automatic operation of relay, relay driver with the help of arduino microcontroller.

I. INTRODUCTION

In India the requirement and availability of energy for power supply is 11,14408 million units and 10,90850 million units for 2015-16 and we also know that the human activities is mostly dependent on electrical power supply. The above fact clearly shows that the supply is not meeting the demand. As a result frequent power-cut is done and uninterrupted power supply is provided. The alternative for this problem is to switch towards renewable energy resources.

Four different sources i.e. solar, mains, inverter and generator are used to provide uninterrupted power supply. Using the solar energy as one of the power source provides the solution for low energy resources since it is a non-renewable source of energy. The second objective of work is to provide automation which make the work faster, reliable, efficient, and reduce human efforts. Arduino Microcontroller is used to provide automation in the switching between four different sources. The automation system used for switching requires separate source to provide an output signal which will operate the four different relays connected to sources respectively.

The main objective of this project is to provide uninterrupted power supply to a load, by selecting the supply source automatically from any available one out of 4 such as: solar, mains, inverter and generator in the absence of power supply. The demand for electricity is increasing every day and frequent power cut is causing many problems in various areas like industries, hospitals and houses. An alternative arrangement for power source is thus desirable.

The output of the arduino microcontroller is given to the relay driver IC, which switches appropriate relay to maintain uninterrupted supply to the load. Output is observed using a lamp drawing power from the mains initially. On the failure of the mains supply the load gets supply from the next available source i.e. an inverter. If the inverter also fails, it switches over to the next available source, and so on. The current status, like which source is supplying power to the load is also displayed on the LCD. As it is not feasible to provide all 4 different sources of supply, one source with an alternate parallel arrangement is provided to get the same function for demo purposes. However 4 different sources if available they can be used.

II. BACKGROUND

The conventional electrical system in Maharashtra by M.S.E.B. is based on only one source placed at consumers end. This system demands to appoint a person to note the continuity. This is exhaustive procedure, which involves a lot of human time effort but still does not produce accurate results. There is lot of complaints regarding to continuation in supply.

Our aim is to solve this problem and provide uninterrupted power supply. The electrical parameters supplied by the various state electricity boards for domestic use as well as to the industrial sector is of great importance from the point view of proper monitoring of the power generated on one end and power consumed on other end.

Also another important factor is revenue generated through sale of electric power, which has to be in tune with investments made for proper generation and distribution. These factors have been of great concern, not only in meeting with the everyday power demands, but also of optimum utilization of electric power.

III. **OBJECTIVE OF THE PROJECT**

The main objective of the project is to design a device that will provide uninterrupted power supply to a load, by selecting the supply source automatically from any available one out of 4 such as: solar, mains, inverter, generator in the absence of the power supply. This is done by using microcontroller, relay and LCD. At the end of this work student will understand:

Operation and description of the 4 different supply.

Operation of relays and their connections.

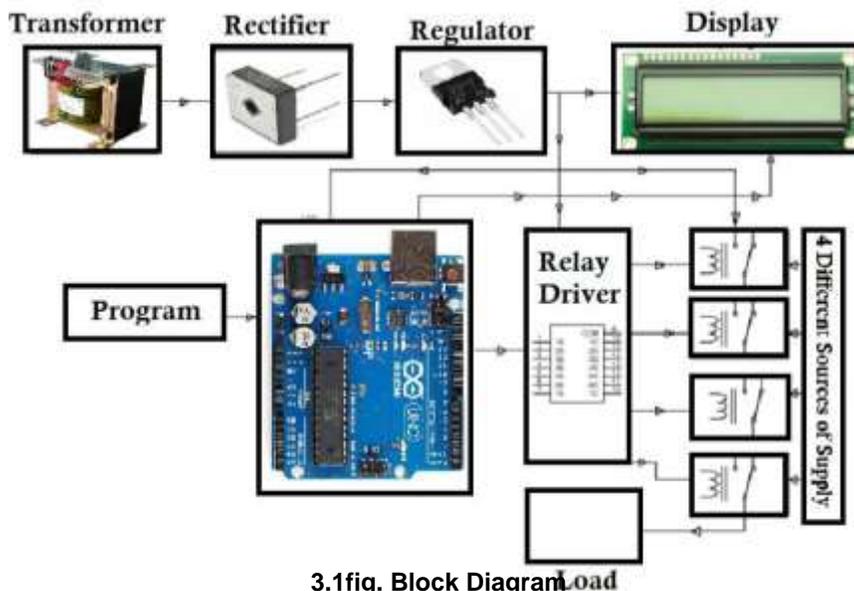How to connect LCD display with arduino microcontroller.

2. METHODOLOGY

The main reason behind to selects this work is there are lot of industries and domestic appliances which work on high voltage supply and are high costly. And some electrical devices need regular or uninterrupted or continuous power supply to work well for longer life span. Many electrical systems are highly sensitive which can be affected by a minute interruption in the power supply line. In the power supply system there are many chances of interruption to take places at any times like power fail/cut off, faults etc. To avoid such types of problems these project system are best which take power supply via four different sources and alternate between them using microcontroller. The merit of this work is that they are reliable and economical.

2.1 Hardware Requirements:

o **Arduino Microcontroller.**
o **Solar Panel.**
o **Battery.**
o **Relays.**
o **LCD.**
o **Lamp.**
o **Push Buttons.**
o **Transformer.**
o **Diodes.**
o **Voltage Regulator.**
o **Crystal.**
o **LEDS.**
o **Capacitors.**
o **Resistors.**

3. BLOCK DIAGRAM

3.1fig. Block Diagram

4.1 Block Diagram Description

The above diagram represents the architecture of the present work includes all major blocks used in the system. Arduino microcontroller is the main component of the system. This microcontroller acts as a brain of the system and controls the function of the system.

This uninterrupted power supply control system works on the principle of auto selection for switch over the load to other available source without interruption or switch off the load. This work uses 4 different sources of supply which drive the load and provide uninterrupted power supply. All the four sources are connected parallel to each other as shown in the block diagram. The sequence of power sources is solar, mains, inverter and generator respectively i.e. highest priority is given to solar and least priority to generator.

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Arduino microcontroller: In this auto power supply control system, the Arduino microcontroller is used for the auto selection of the available source. It shifted the load to the other power supply source automatically without any interruption and is powered up with 5V dc voltages. It is interfaced with LCD display and relay driver IC.

Transistor as a Relay Driver: In this auto power supply control system, the relay driver i.e. a transistor is used for driving the load relays. This relay receives the signal from microcontroller for shifting the load on another supply source. It is powered up with 5V dc and interfaced with microcontroller.

Transformer: The transformer is used for connecting this system directly to 220V AC. It steps down 220V into 12V.

Voltage Regulator: The voltage regulator is used for regulating 12V DC into 5V DC voltages for supplying the power to the LED, microcontroller and other components. IC LM 7805 voltage regulator is used for regulating voltages.
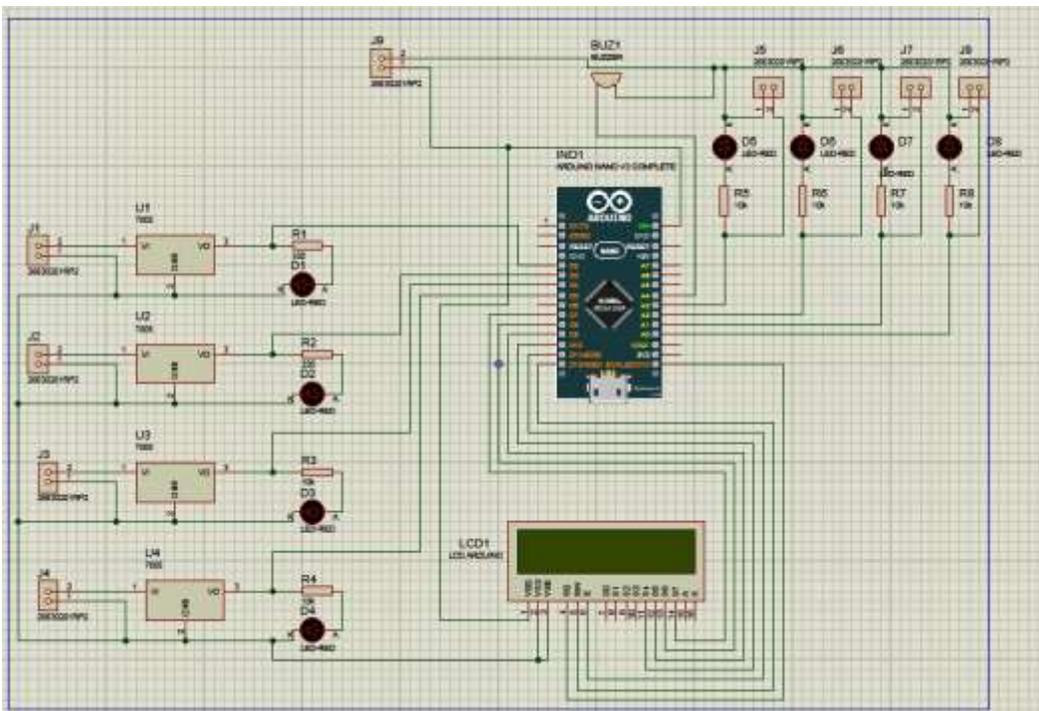
LCD Display: LCD display is used for displaying the source of supply on which the whole system is working.

FILTERS: Capacitive filters are used in this work. It removes the ripples from output of the rectifier. The DC output received from this filter is constant until the mains voltage and load is maintained constant but if either one of the quantities is vary; the DC output received at this point changes. To overcome this drawback a regulator is applied at the output stage of the filter.

RECTIFIER: In this work bridge rectifier is used due to its merits like full wave rectification and high stability. For a single half of the cycle only two diodes will be in forward bias condition.

LCD Display: this display is used to display the present sources and also which source is currently used for supply to the load.

4. CIRCUIT DIAGRAM

4.1 fig. Circuit diagram

4.1 Circuit Diagram Description

Auto supply switching is basically selection of supply from multiple available power sources automatically by using arduino microcontroller concept that is t o check the availability of the source and switching to that available source to ensure uninterrupted power supply to load. In ca se of the electrical appliance control using automation causes more safety.

Auto supply switching is a prototype for the same which is auto change to other source when main supply fails without human interaction in this system we are designing an embedded circuit to control and ensure auto supply switching. In case all 4 sources are available, then the switching will be in the default source. Four relays are there to control t he switching. 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.

In this project we are having 4 switches which we consider as 4 different source of supply. W hen we press any of the switches it shows the absence of that particular source which is connected to arduino microcontroller as input signals. Here we are using arduino microcontroller. The output of microcontroller is given to the as a relay driver. The c urrent phase working is displayed on LCD also.

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 solar suppl y, mains supply, inverter supply and generator supply we used one source and a set of relays. We have taken first source with mai ns supply and assumed as if being fed from 4 different sources by connec ting 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 co rresponding supply respectively and are interfaced to th e controller. Initially we have given high input signal to the arduino micr ocontroller, 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 pre ssed that represents failure of mains supply as a result the supply is provided from the next source and the arduino 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 generat or 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 re lay 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.

5. Working of Multisource Power Supply With No Break Technique Using Arduino Microcontroller

When the supply from all the sources (solar, mains, inverter and generator) are ready, the load will be driven by the solar power supply. If solar get failed, the supply automatically shifts to main. To proceed further, if the main get failed, the supply is provided from inverter and so on. Priority is assigned to each power source in the order of solar, mains, inverter and generator. In case the solar power fails, the supply should automatically shift to main but if solar also fails at the moment then the supply will automatically shift to next priority source. Above figure explains the working and construction of the Auto power supply from four different sources. As shown in the diagram the four sources are Solar solar, mains, inverter and generator, four relays are used to provide protection at each respective output. This output can be used to drive any load such as a lamp or motor. LEDs are used to display the source of supply. Other case is when the power switches from one source to another source, say main fails and supply shifts to inverter, if the solar come back then the supply will automatically reach back to solar power instead of switching to mains. At the output of microcontroller, each output port is connected to positive dc voltage. Relays are used in contact with the output port to provide switching at the output.

The project uses an arrangement where 4 different sources of supply are provided to a load so as to have an uninterrupted operation of the load. The source of 12v supply is used from four different sources. The ac source to the fan is connected to relay 1 to relay 2 to relay 3 and relay 4 by making the entire "NO" (normally open) contacts parallel and all the common contacts in parallel.

6. Arduino Microcontroller

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.

Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments. All Arduino boards are completely open-source, empowering users to build them independently and eventually adapt them to their particular needs. The software, too, is open-source, and it is growing through the contributions of users worldwide.

7. CONCLUSION

This work is use to provide a continuous power to the load through any of the sources from which we are operating the device i.e. main line, generator, inverter and solar automatically in the absence of any of the source. The complete operation is based on the microcontroller. This work is a low-cost, reliable, efficient system. The work can be further enhanced by using other sources like inverters also and then taking into consideration for using the best possible power source whose tariff remains lowest at that moment.

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