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AUTOMATIC ACTIVE PHASE SELECTOR FOR SINGLE PHASE LOAD FROM THREE PHASE SUPPLY

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ABSTRACT:
Phase absence is a very common and severe problem in any industry, home or office. Many times one or two phases may not be live in three phase supply. Because of this, many times, some electrical appliances will be on in one room and OFF in another room. This creates a big disturbance to our routine work.This project is designed to check the availability of any live phase, and the load will be connected to the particular live phase only. Even a single phase is available, and then also, the load will be in ON condition.This project is designed with Arduino MCU. This controller continuously checks for live condition of all phases connected to it, and the controller connects the load to the active phase using a Relay. This relay is driven with a transistor. If two or three phases are live, the load will be connected to phase I only. An LCD is provided to display the status of the phase condition. Contrast control preset is given for LCD contrast control. This project uses regulated 12V, 500mA power supply. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac out put of secondary of 230/12V step down transformer.

I.INTRODUCTION

Phase absence is very common in industry, home or office. Many times one or two phases may not be alive in three phase supply. Because of this some applications will be ON in one room and OFF in another room. This creates a big disturbance to our routine work. This project is designed to check the availability of any live phase, and the load will be connected to the particular live phase only. Even a single phase is available the load will be ON condition. Whenever the phase is not available the buzzer will ON. If any one or two phases in a three phase supply interrupted or goes low and you want the equipment to work normal voltage then this circuit will give you the solution. This system is designed to monitor the presence of supply to the three phase and to display the condition of each phase on an LCD. Most industrial and commercial applications depends upon the power supply. By using this circuit we can solve the problem of low voltage in single phase system.

The project is designed to provide uninterrupted AC mains supply i.e., 230 volt to a single phase load. This is achieved by automatic changeover of the load from the missing phase to the next available phase in a 3 phase system. It is often noticed that power interruption in distribution system is about 70% for single phase faults while other two phases are in normal condition. Thus, in any commercial or domestic power supply system where 3 phase is available, it is advisable to have an automatic changeover system for uninterrupted power to critical loads in the event of missing phase. In this system auto selection is achieved by using a set of relays interconnected in such a way that if one of the relay feeding to the load remains energized always. Under the phase failure condition the corresponding step down transformer secondary delivers zero voltage which is duly rectified to DC and then fed to the logic gates comprising of AND & OR to switch on the next relay that delivers the power to the load. It also has a provision of connecting to an inverter source which delivers uninterrupted power to the load incase all the 3 phases go missing. The project is supplied with three transformers connected to the 3 phases supply. Further the project can be enhanced by incorporating power semiconductor devices such as thyristors/IGBTs for instantaneous changeover to the next available phase. This overcomes the drawback of the changeover time

generally witnessed by relay switching operations.

II.LITERATURE SURVEY

In three phase applications, if low voltage is available in any one or two phase and you want your equipment to work on normal voltage, this circuit will solve your problem. The automatic phase changer was made from electronic components which includes ; AT89C51 , ULN2003 , ESP8266 , buzzer , resistor , 16X2 LCD , relays , bridge rectifier, crystal oscillator, capacitors , transformers . Results obtained during the test shows that , whenever the system senses a higher voltage across the three inputs and then engages the load .there are many designs and prototype systems that can perform almost similar functions like, single phase changeover switches two phase automatic transfer switch ,three phase automatic change over switch ,but this prototype is about an automatic phase switch over (phase selector) which is designed for only three phase A.C input power to single phase output application . The system is high complexity in “automatic voltage regulator” using ac voltage. Ayan Gosh et.al. Says in the paper “Design of automatic phase selector from any available three phase supply” power failure is a common problem. It hampers the production of industry, construction work of new plants and building. It can be overcome by using a backup power supply such as a generator .The main aim of this paper is to present the real idea of an automatic phase switch for 220V or 240V alternating current . Although , there are many designs that can perform almost similar functions like , single phase changer -over switches, two phase automatic transfer switch and three phase automatic change over switch ,but this model is about an automatic phase switch over (phase selector) which is designed for only three phase A.C input power to single phase output application

III. DESIGN OF HARDWARE

This chapter briefly explains about the Hardware implementation of Automatic phase changer. It discuss the circuit diagram of each module in detail.

3.1.ARDUINO UNO

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode.Arduino board has the following new features:

- 1.0 pinout: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible both with the board that use the AVR, which operate with 5V and with the Arduino Due that operate with 3.3V. The second one is a not connected pin, that is reserved for future purposes.
- Stronger RESET circuit.
- Atmega 16U2 replace the 8U2.

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

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Fig: ARDUINO UNO

3.2. POWER SUPPLY

The power supplies are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices. A power supply can by broken down into a series of blocks, each of which performs a particular function. A d.c power supply which maintains the output voltage constant irrespective of a.c mains fluctuations or load variations is known as "Regulated D.C Power Supply".

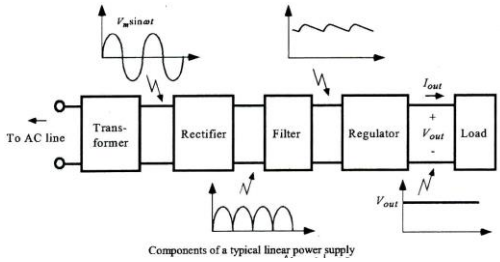
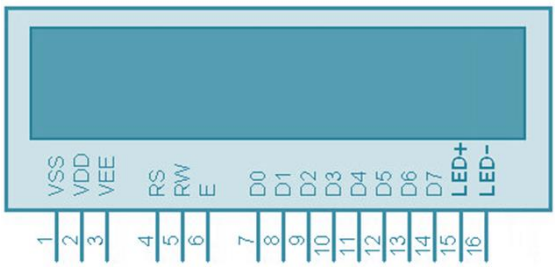


Fig:Power Supply

3.3 LCD

Liquid Crystal Display also called as LCD is very helpful in providing user interface as well as for debugging purpose. The most commonly used Character based LCDs are based on Hitachi's HD44780 controller or other which are compatible with HD44580. The most commonly used LCDs found in the market today are 1 Line, 2 Line or 4 Line LCDs which have only 1 controller and support at most of 80 characters, whereas LCDs supporting more than 80 characters make use of 2 HD44780 controllers



3.4RELAYS

We know that most of the high end industrial application devices have relays for their effective working. Relays are simple switches which are operated both electrically and mechanically. Relays consist of a n electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet. There are also other operating principles for its working. But they differ according to their applications. Most of the devices have the application of relays.

The main operation of a relay comes in places where only a low-power signal can be used to control a circuit. It is also used in places where only one signal can be used to control a lot of circuits. The application of relays started during the invention of telephones. They played an important role in switching calls in telephone exchanges. They were also used in long distance telegraphy. They were used to switch the signal coming from one source to another destination.

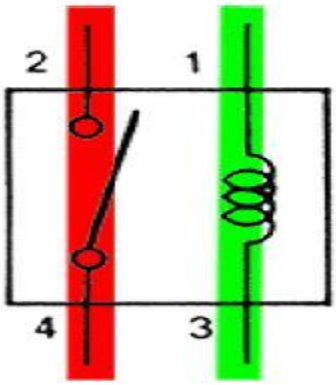


Fig: relay

3.5LIGHT DEPENDENT RESISTOR

A photo resistor or light dependent resistor (LDR) is a resistor whose resistance decreases with increasing incident light intensity; in other words, it exhibits photoconductivity. It can also

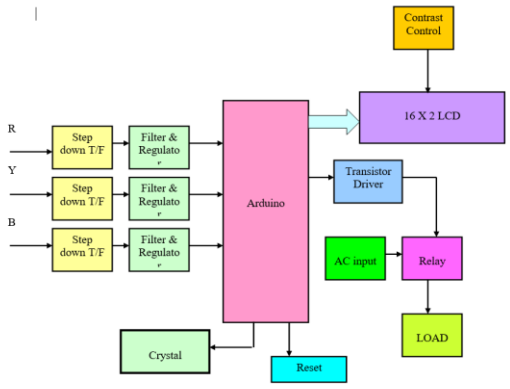
be referred to as a photoconductor or CdS device, from "cadmium sulfide," which is the material from which the device is made and that actually exhibits the variation in resistance with light level. Note that CdS is not a semiconductor in the usual sense of the word (not doped silicon).

A photoresistor is made of a high resistance semiconductor. If light falling on the device is of high enough frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electron (and its hole partner) conduct electricity, thereby lowering resistance.

IV. PROJECT DESCRIPTION

This project ensures that the customers can easily identify the

Block diagram:



Working:

It monitors the presence of three phases and to display the condition of each phase on a LCD. • It monitors the voltage condition of the each phase. If voltage level of any phase is under the rated/specified voltage rating, immediately this phase is connected to a healthy phase thus, supplies to the load. • The phase voltage is stepped down 230V to 12V, 300mA. shifting Thus appliances are protected against under voltage by the AC supply to the absence phases.

. Display "ACTIVE PHASE SELECTOR SYSTEM" On LCD. 2. When Phase I is active at that time relay 1 Active To ON the Load, Wait for the message Phase I is active to be displayed on the LCD. 3. When Phase II is active at that time relay 2 active to ON the Load, Wait for the message Phase II is active to be displayed on the LCD

When Phase III is active at that time relay 3 active to ON the Load, Wait for the message Phase III is active to be displayed on the LCD. 5. So Phase I is selected from the 3 phases by default in order to run the single phase load when all phase will active. 6. In the absence of Phase I, Phase II is selected and the same message is displayed on the LCD. 7. If the phase II is absent then the phase III is selected to run the single phase loads. 8. In the presence of the first phase the phase selection will be switched to the first phase though it is being presently run by the second or third phase. 9. The phase on which the single phase load is being run will be displayed on the LCD. 10. All the Process repeat continuously by the Present Condition Respectively.

V.CONCLUSION

Unfortunately though the poor availability of public utility power in the developing countries has pushed her citizens to seek alternatives and dependent means of electricity .This has resulted in individuals buying wind turbines, solar panels, generating sets and so on. Unavoidably this requires careful selection of the one to be ON to their use – alternative power or public power utility. According to the result it is seen that we get the desired output from the auto phase selector. Automatically it is selecting the active phase when the connected phase is absent. But our main objective is to select an active phase

automatically to save the time and without hampering the work. This objective is satisfied successfully here.

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