Power Supply Control from Different Sources

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Abstract— The main purpose of this project is to provide continuous power supply to a load, by selecting the supply from any of the four sources namely solar, inverter, main and generator automatically in case if one the source is absent. The need of electricity is increasing day by day and the frequent power cuts of electricity are causing many problems in different areas like banks, colleges/schools, hospitals, houses and industries. Thus there is requirement for an alternate arrangement of power supply. This arrangement can be designed by using ARM7 microcontroller and relays. When a source, say mains fails the supply automatically shifts to next priority source generator and so on. LEDs (Light emitting diodes) can be used to show that which source is used to provide the supply**.**

Index Terms—ARM7, GSM, Relay Driver IC, LCD.

1 ITRODUCTION

An important requirement of electric power distribution systems is the need for automatic operation. In particular, the rapid and reliable transfer of the system from one power source to another during certain system events is important to achieving the reliability goals for such systems and the facility serves.

In the existing system, they made four switches to demonstrate the corresponding failure of that power supply. By pressing any one of the switch, absence of that particular source can be found out. The switches are connected as input signals to microcontroller. In this system 8051 microcontroller is used. The relay driver IC collects output of microcontroller, which adjusts relay to maintain continuous supply to the load. In this proposed system, we made use of GSM technology, which helps in operating the system from the different places. This GSM technology is a latest technology, which is use to collect the information about the different sources either the switch is ON or OFF. In this system, we made use of ARM7 Microcontroller which has many advance features than 8051 microcontroller.

2 REVIEWS OF SYSTEM COMPONENTS

This section discusses the basic theory of components used for this work. Though, we will be more focused on the heart of the system design (Microcontrollers) and its peripherals while we leave other basic electronic components. But interested readers can see [2-6] for theory of other components used.

2.1 Relays:

Relays are electromechanical devices or solid state devices which operate in response to a signal which may be voltage, current, temperature etc. Electromagnetic relays operate due to magnetic fields. They are composed basically of two parts: (1) The operating coil and (2) The magnetic switch. When an input pulse is introduced into the coil, a magnetic field is produced in the core of the electromagnet. This action causes the switch to slide. Relays are either normally open or normally close. Relays are available for DC or AC excitation and coil voltages range from 5V to 230V.

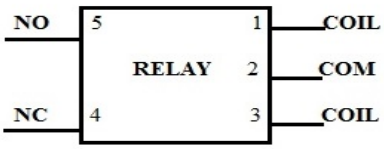

Figure 1: Pin Diagram

2.2 Microcontroller:

A microcontroller (MCU) is a single computer chip or integrated circuit that has the ability to execute written user programs. The MCU is normally used for the purpose of controlling some devices – this actually gives it its name microcontroller. The user program can be stored within the MCU or on an external chip called an Erasable Programmable Read Only Memory (EPROM). MCU are normally integrated into small devices like the microwave ovens, keyboards and cell phones. The microprocessor that is universally accepted is not the same as a microcontroller. An MCU requires a small amount of computing power, less memory and very little attachment accessories. MCU-based systems are far more reliable and cheaper. Their small size also makes them

desirable for circuit designers. It possesses an internal comparator that acts like an OP-AMP comparator. It also has a clock (crystal) that runs at a frequency of 12MHz – this frequency is chosen so as to make the MCU trigger faster. The MCU takes charge of sending pulses that enable the charging circuit for the battery, the software application interface and the tracking of safe battery operational level.

2.3Voltage Regulators:

These two voltage regulators are used to give a constant DC voltage of 15V (LM7815) and 5V LM78L05. They act as stabilizers due to the fact that the circuit components are to run on DC voltage that contains negligible or no pulsations at all. These regulators give an unvarying output. The LM7815 uses a heat sink due to its nature to heat up. The LM78L05 however does not need a heat sink. Both the two regulators have a maximum current drawn of 1A each. The LM7815 gives an output of 15V that is fed into the comparator (LM741), though due to configurations it is not directly used as a reference voltage. The two relays RLAI and RLA2 also feed from this terminal. The LM78L05 gives an output of 5V that is fed to the microcontroller unit. This terminal must at all times have an output of 5V either from the rectified power or the battery terminal because the microcontroller oversees the general control of the whole circuit and must always be powered. This regulator is fed by a joint from two diodes (IN4001) which prevent a flow back of current and are the alternating sources of voltage to the regulator.

2.4 Relay Driver IC UNL2803:

The Eight NPN Darlington connected transistors in this family of arrays are ideally suited for interfacing between low logic level digital circuitry (such as TTL, CMOS or PMOS/NMOS) and the higher current/voltage requirements of lamps, relays, printer hammers or other similar loads for a broad range of computer, industrial, and consumer applications. The ULN2803 is designed to be compatible with standard TTL families while the ULN2804 is optimized for 6 to 15 volt high level CMOS or PMOS.

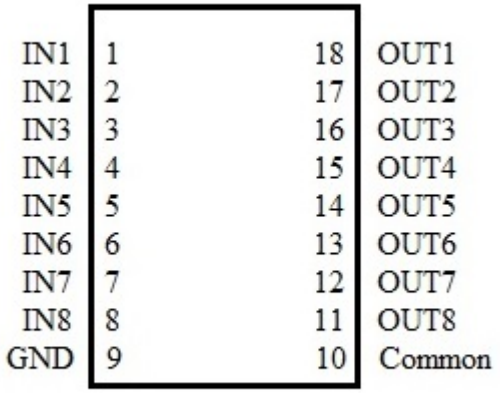

Figure 2: Pin Diagram (ULN2803)

3 Block Diagram And Circuit Schematic

3.1 Block Diagram

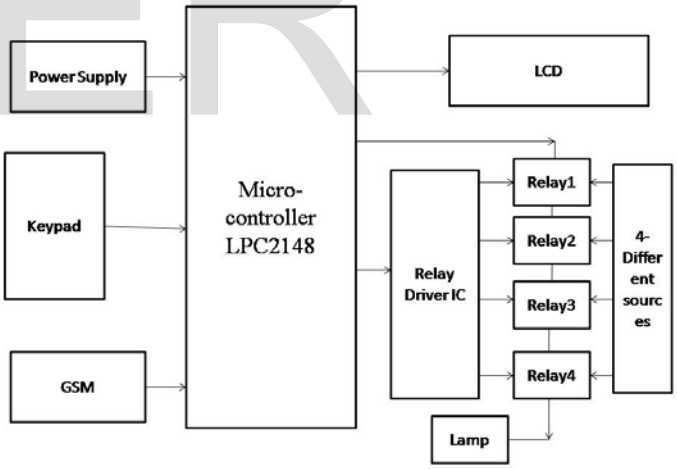

Figure 3: Auto Power Supply Control from Four Different Sources

3.2 CIRCUIT SCHEMATIC

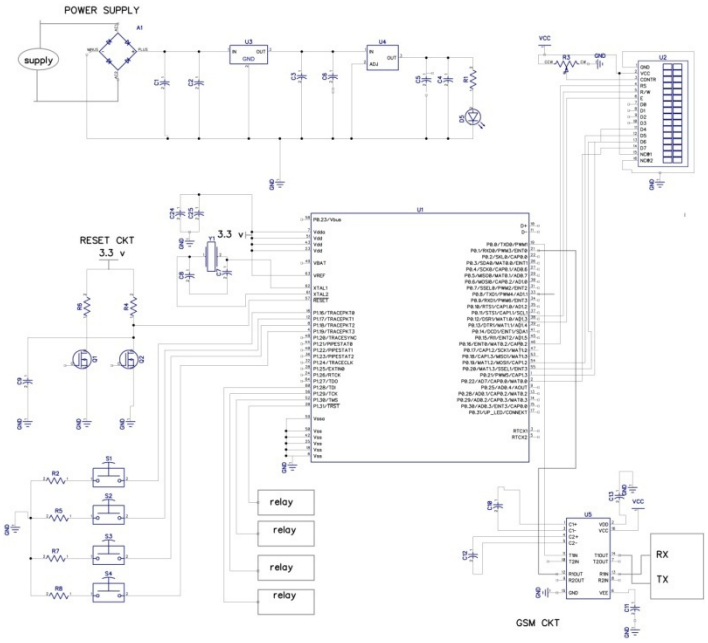

Figure 4: Circuit Schematic

4 WORKINGPRINCIPLE

This project uses an arrangement of four 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 four sources of supply such as solar supply, inverter supply, main supply and generator supply, we used one source and a set of relays. We have taken first source with solar supply and assumed as if being fed from four different sources by connecting all the four 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. Four 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 solar is pressed that represents failure of solar 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 inverter button, it indicates the inverter or 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.

5 FLOWCHART

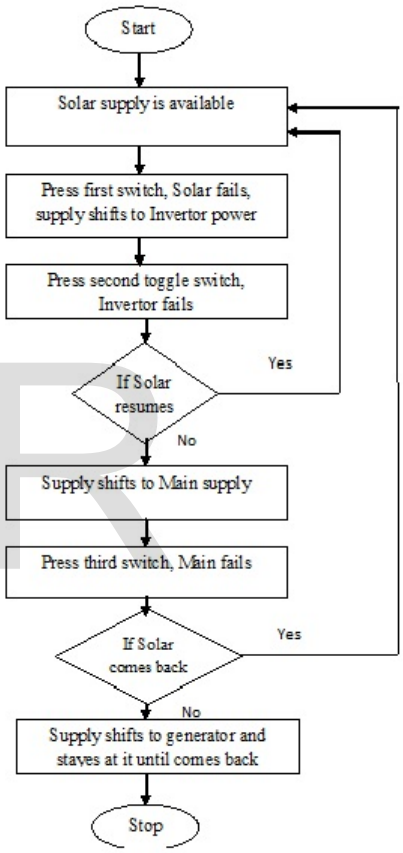

Figure 5: Flowchart of operation.

6 CONCLUSION

In the "Power supply from four different sources: Solar, Inverter, Main and Generator" has been explained in this project with all its features and details. The significance of this project lies in its various advantages and wide places of applications such as Industries, Hospitals, Banks; etc.It has been developed by integrating Colleges/Schools, etc. 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.

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