IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Impact Factor: 4.819
Volume 3, Issue 1, March 2021

Automatic Uninterrupt Power Control System for Remotely Operated Communication System

P. Sujidha, T. Shanmuga Priya, P.Radha, A.Usha and M.Sarojini Devi
Department of Electrical and Electronics Engineering
Mohamed Sathak Engineering College, Ramanathapuram,TamilNadu, India

Abstract: *Most of the Mobile base stations operate on EB power and Diesel generator based backup power. During the EB mains failure the generator is switched on manually. Once the power is restored the DG is switched off manually. This manual operation demands human presence all through the day. The proposed work involves complete automation and remote supervision for remotely operated communication stations. The purpose of the emergency diesel system is to provide reserve power, as it is essential that electricity is always available to the maintained system. In case of a black out or a power failure in the main power supply, the diesel generators can be quickly turned on to keep the necessary devices available. This work aims at identifying the best power source to be fed for the communication infra-structure, if the mains are available; this system chooses the best phase to supply the load. This is achieved by sensing the mains voltage in three phases. The phase with nearly 230v supply is chosen as best phase. If anyone phase is not available the control switches to next healthy phase. If mains fail, the system automatically switches to battery based supply. When the storage battery drains a diesel generator is automatically started to provide the backup power supply. The system again checks another battery that runs the pony motor that starts the DG. If the battery has enough voltage, the DG is switched ON. The DG once switched on the system verifies whether the voltage is developed. Once the voltage is developed the system connects the load to the DG output. VI This system involve multiple PT'S for identifying the best phase and other sensors like fuel level, lubricant oil indicators, temperature sensors and battery status monitors. This system manages a constant voltage power supply from multiple power sources.*

Keywords: GSM,UPS.

I. Introduction

Due to the broader applications of nonlinear loads, the degree of waveform distortion and other transients found in a power system has become increasingly serious. In order to maintain a certain high level of electric power quality, uninterruptible power supply (UPS) has emerged as a potential alternative, which was also widely applied at the customer side in order to mitigate the unexpected disturbances over the last few decades. Principally, the UPS employs the static power converter as well as batteries to supply the critical load. Its circuit structure can be categorized into three types that include off-line, on-line, and line-interactive ones. For the off-line UPS, when the utility source encounters any event that leads to the interruption of power supply, the off-line UPS circuit would supply the power to the load through the inverter, yet the load needs to shoulder the power interruption blame for about 4– 12ms. As for the on-line UPS, because of its voltage-stabilizing function, the power quality of the connected loads would be better assured. However, the resultant large heat losses through the double ac/dc operation may degrade the energy conversion efficiency. Different from the aforementioned structure, the line interactive UPS employs one inverter (dc/ac power converter) to operate in parallel with the utility grid, by which the battery charge and discharge can be both served for, hence, facilitating the mode change within a shorter time in case of power outage, while the operational losses can be controlled in a significant manner. The design of line-interactive UPS has put power quality improvement into consideration. When the mains voltage is normal, UPS serves as a shunt active power filter to curb the harmonics and compensate the power factor of loads. 2 Once encountering the loss of mains power, the line-interactive UPS will be immediately switched off-grid in order to work as an emergent power source, ensuring that the stored dc energy is converted to ac power while maintaining a reliable power to loads in spite of any loss of utility. Several technical difficulties were reported in the circuit design process. This may be attributed to the fact that the harmonic compensation as well as load voltage control are both imperative in the line-interactive UPS; therefore, the control circuit often becomes complex. Besides, the design performance is often affected because of the mode-switching transients.

II. Proposed Topology

When AC is applied to the primary winding of the power transformer it can either be stepped down or up depending on the value of DC needed. In our circuit the transformer of 230v/15v is used to perform the step down operation where a 230V AC appears as 15V AC across the secondary winding. In the power supply unit, rectification is normally achieved using a solid-state diode. Diode has the property that will let the electron flow easily in one direction at proper biasing condition. As AC is applied to the diode, electrons only flow when the anode and cathode is negative. Reversing the polarity of voltage will not permit electron flow. A commonly used circuit for supplying large amounts of DC power is the bridge rectifier. A bridge rectifier of four diodes (4*IN4007) is used to achieve full wave rectification. Two diodes will conduct during the negative cycle and the other two will conduct during the positive half cycle. The DC voltage appearing across the output terminals of the bridge rectifier will be somewhat less than 90% of the applied RMS value. Filter circuits, which usually capacitor is acting as a surge arrester always follow the rectifier unit. This capacitor is also called as a decoupling capacitor or a bypassing capacitor, is used not only to 'short' the ripple with frequency of 120Hz to ground but also to leave the frequency of the DC to appear at the output. The voltage regulators play an important role in any power supply unit. The primary purpose of a regulator is to aid the rectifier and filter circuit in providing a constant DC voltage to the device. Power supplies without regulators have an inherent problem of changing DC voltage values due to variations in the load or due to fluctuations in the AC liner voltage. With a regulator connected to the DC output, the voltage can be maintained within a close tolerant region of the desired output. The regulators IC7812 and 7805 are used to provide the +12v and +5v to the circuit. 69 PIC16F877A is a 40 Pin DIP pack IC with 33 I/O pins. Out of which 9 pins can be used either as Digital I/O pins or Analog Input pins. The micro controller is having 5 ports Port A, Port B, Port C, Port D and Port E. Here Port A consists of 6Pins and can be used as Analog Pins and Digital Pins, in the same way Port E consists of 3Pins all of them can either be used as Analog Pins or Digital Pins. The Port pins of Port D are connected to LCD pins. RD0 to RD3 pins are data pins and RD5 to RD7 pins are control pins. The Pins 13 and 14 are connected to Oscillators. This Oscillator provides required clock reference for the PIC microcontroller. Either Pins 11 and 12 or 31 and 32 can be used as power supply pins. The 5v supply is given to the 11 th and 32 pin and GND is connected to the 12 th and 31 th pin of microcontroller. Pins 25 and 26 of Port C are used for serial Port communications; these pins are interfaced with MAX232 for PC based communications. Pins 39 and 40 are used for In-Circuit Debugger Operations, with which the hex code is downloaded to the Chip. Pin 33 is used as external Interrupt Pin. Pin 1 is used as Reset Pin. This Pin is connected to Vcc through a resistor. The LCD we have used in this project is HD1234. This is an alphanumeric type of LCD with 16 pins. Of which Pins 7 to 14 are used as data pins, 11 to 14 pins are connected to port D of PIC16F877A microcontroller. There are 3 control pins RS (Pin-4), RW (Pin-5) and EN (Pin-6). The RS pin is connected to the 20 th Pin of micro controller. The RW pin is usually grounded. The RW is connected to 21 th Pin. The EN pin is connected 19 th pin. The LCD has two Rows and 16 Columns. The LCD is powered up with 5V supply connected to Pins 1(GND) and 2(Vcc). The Pin 3 is connected to Vcc through a Potentiometer.

The potentiometer is used to adjust the contrast level. Here in our project we use the PIC controller in 4-bit mode. Here only 4 data pins are connected and are used as Data Port. 70 The relays are connected to microcontroller through ULN2003 relay driver IC. The ULN2003 has 16 pins. The 9 th pin of ULN2003 is Vcc and 8 th pin of the ULN2003 is GND. The 12V supply is given to the 9 th pin of the ULN2003. The ULN2003 has 7 input pins (1-7) and 7 output pins (10-16). The ULN consists of Darlington arrays. The 1 st pin of ULN2003 is connected to the 40 th pin of the

PIC16F877A microcontroller. The 16 th pin of the ULN2003 is connected to the relay, which drives the relay. A temperature sensor LM35 is interfaced to the ADC port of PIC16F877A microcontroller. The output voltage from the LM35 is linearly proportional to the measuring temperature.

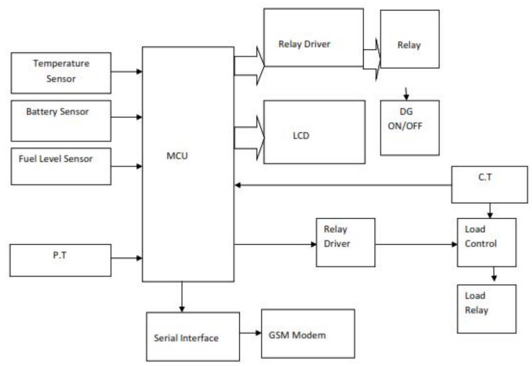

Figure 1: Block diagram of uninterrupt power control system for remotely operated communication system

The internal ADC converts the output voltages from the LM35 into digital signals, which correspond to the measured temperature. The Three pins are VCC, Output and Ground. The output voltage of the LM35 increases by 10 mV per 1° rise in temperature. This LM35 can measure temperature ranging from -55°C to 150°C.The 5V supply is given to the 1 st pin and GND is given to the 3 rd pin of LM35. The 2 nd pin (output) of LM35 is connected to the 2 nd pin of PIC16F877A microcontroller. The level sensor and battery sensor are connected to the 3 and 4 th Pin of the PIC16F877A microcontroller.

III. EXPERIMENT AND RESULT

An effective approach for the control circuit design of the line interactive UPS becomes crucial for both utility engineers and industry manufacturers. In this work, based on the paradigm of the inverter operation, a new design approach for a line-interactive UPS is proposed.

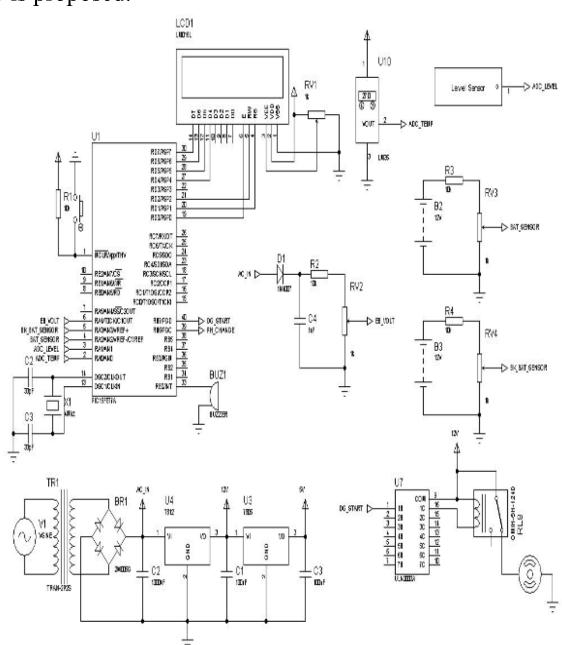

Figure 2: Main Circuit for remotely operated communication system

In the method, a unified control system associated with the special connection scheme in the inverter is developed for simplifying the system structure, where each phase only requires one current transformer (C.T.) to serve the controller for both operating schemes. In this way, the overall circuit design becomes easier to accomplish and the implementation cost can be also reduced. Besides, as this approach was aimed to minimize the mode-switching transients, the transfer time spent for the switch made between the parallel operation and the off-grid operation can thus be shortened. In this work "LCD, Microcontroller, temperature sensor, level sensor, battery sensor and relay" are chosen are proved to be more appropriate for the intended application. The project is having enough avenues for future enhancement. The project is a prototype model that fulfills all the logical requirements.

IV. Conclusion

The project with minimal improvements can be directly applicable for real time applications. Thus the project contributes a significant step forward in the field of "Intelligent Automation", and further paves a road path towards faster developments in the same field. The project is further adaptive towards continuous performance and peripheral up gradations. This work can be applied to variety of industrial and commercial applications.

References

[1] Valerie A. Price, "UPS systems: Powering Up Process Performance," Intech, July 2018, pp. 38-41.
[2] VladiBasch, "Fallacies and Facts of UPS Systems," Plant Engineering, June 3, 2018, pp. 72-74.
[3] SAA09UP05-001, "System Assurance Analysis of the Uninterruptable Power Supply System at the Orbiter Processing Facility High Bay-3"
[4] SAA09UP01-001, "System Assurance Analysis of the Uninterruptable Power System (Exide) UPS 2, 2A, 3, 3A at the Launch Control Center"
[5] D.G. Hart, B. Ackerman, R. Wright, and Brian Johnson, "DA: integrated substation and feeder automation,"DistribuTech Conference Proceedings, February 2018.
[6] D.G. Hart, W. Peterson, D. Uy, J. Schneider, D. Novosel, R.Wright, "Tapping protective relays for power quality information,"IEEE Computer Applications in Power, vol. 13, no. 1, January 2000.Modicon Modbus Protocol Reference Guide, PI-MBUS-300, Modicon, Inc., 2017