

Automation in Load Shedding Using Microcontroller

VISHAL V. MEHTRE¹, UTKARSH CHAURASIA², NIKHIL SUNDRAM³, PRINCE KUMAR⁴

¹ Assistant Professor, Department of Electrical Engineering, Bharati Vidyapeeth University, Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune, Maharashtra

^{2, 3, 4} Student, Department of Electrical Engineering, Bharati Vidyapeeth University, Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune, Maharashtra

Abstract- The project is an automatic load operation system that controls load operation, multiple numbers of times according to programmed instruction. The project eliminates the manual ON/OFF switching of load. A real time clock (RTC) is used to track the time and automatically switch ON/OFF the load. This project is required for load shedding time management which is used when the electricity demand exceeds the supply and there comes a need for manually switching ON/OFF the electrical devices in time. Hence this system eliminates the manual operation by automatically switching the load ON/OFF. A matrix keypad is interfaced with the microcontroller from where the specified time is input to the microcontroller. When this input time equals to the real time, based on the commands the microcontroller initiates that particular relay to switch ON/OFF the load. The time is displayed on a seven-segment display.

Indexed Terms- Embedded system, Hardware Requirements, Software Requirements, seven segment display, Cross compiler, CPU Simulation

I. INTRODUCTION

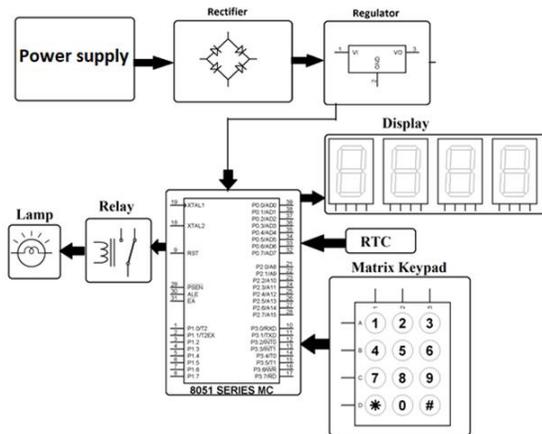
An Embedded System^[1] is a combination of computer hardware and software, and perhaps additional mechanical or other parts, designed to perform a specific function. An embedded system is a microcontroller-based, software driven, reliable, real-time control system, autonomous, or human or network interactive, operating on diverse physical variables and in diverse environments and sold into a competitive and cost conscious market. An embedded system^[1] is not a computer system that is used primarily for processing, not a software system on PC or UNIX, not a traditional business or scientific

application. High-end embedded^[3] & lower end embedded systems. High-end embedded system - Generally 32, 64 Bit Controllers used with OS. Examples Personal Digital Assistant and Mobile phones etc. Lower end embedded systems - Generally 8,16 Bit Controllers used with an minimal operating systems and hardware layout designed for the specific purpose. Examples Small controllers and devices in our everyday life like Washing Machine, Microwave Ovens, where they are embedded in. Here, first we need to fetch the code to microcontroller and then after simulation is done using Proteus software where Keil vision 5 is used for coding purpose.

1.1 INTRODUCTION TO KEIL MICRO VISION (IDE)

Keil development tools for the 8051 Microcontroller^[1] Architecture support every level of software developer from the professional applications engineer to the student just learning about embedded software development. When starting a new project, simply select the microcontroller you use from the Device Database and the μ Vision IDE^[3] sets all compiler, assembler, linker, and memory options for you. Keil is a cross compiler. So first we have to understand the concept of compilers and cross compilers. Compilers are programs used to convert a High Level Language to object code. A cross compiler^[1] is similar to the compilers but we write a program for the target processor (like 8051 and its derivatives) on the host processors (like computer of x86). It means being in one environment you are writing a code for another environment is called cross development. And the compiler used for cross development is called cross compiler.

II. BLOCK DIAGRAM



III. COMPONENTS

3.1 MICROCONTROLLER

8051 microcontrollers^[1] is designed by Intel in 1981. It is an 8-bit microcontroller. It is built with 40 pins DIP (dual inline package), 4kb of ROM storage and 128 bytes of RAM storage, 2 16-bit timers. It consists of are four parallel 8-bit ports, which are programmable as well as addressable as per the requirement. An on-chip crystal oscillator is integrated in the microcontroller having crystal frequency of 12 MHz.

3.2 SEVEN SEGMENT DISPLAY

Seven segment displays^[2] are the output display device that provide a way to display information in the form of image or text or decimal numbers which is an alternative to the more complex dot matrix displays

3.3 RELAY

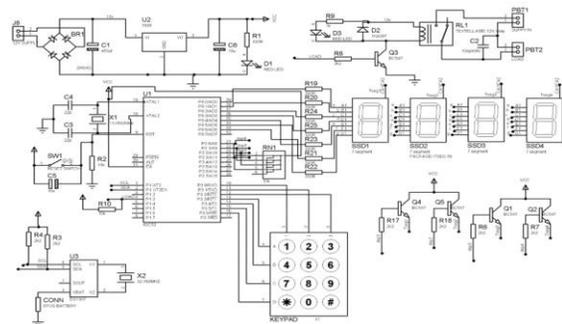
A relay^[1] is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism mechanically, but other operating principles are also used. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. Relays allow one circuit to switch a second circuit which can be

completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits; the link is magnetic and mechanical

3.4 RTC

The DS1307 serial real-time clock (RTC)^[3] is a low-power, full binary-coded decimal (BCD) clock/calendar plus 56 bytes of NV SRAM. Address and data are transferred serially through an I²C, bidirectional bus. The clock/calendar provides seconds, minutes, hours, day, date, month, and year information. The end of the month date is automatically adjusted for months with fewer than 31 days, including corrections for leap year. The clock operates in either the 24-hour or 12-hour format with AM/PM indicator. The DS1307 has a built-in power-sense circuit that detects power failures and automatically switches to the backup supply. Timekeeping operation continues while the part operates from the backup supply.

IV. CIRCUIT DIAGRAM



V. DESCRIPTION

ADVANTAGES:

- Reduces the chances of the Human Error by eliminating the manual work.
- Time efficient as the power supply will be ON/OFF as per the scheduled time.
- As it will benefit the consumers also. They will come to know about the time that when the power supply will be cut off.
- We can track the peak times when the power demand is high and shift some of the load to non peak time.

- It will reduce operation time and work handling time.

DISADVANTAGES:

- Unemployment rate will increase due to machines replacing humans.
- Load shedding results in unsatisfying consumers and lose in revenue in economy.

APPLICATIONS:

- Power distribution companies to shed load automatically, reduce downtime for critical loads, reduce spinning reserve requirements etc.
- Implemented in factories to manage the ON/OFF time of different generator sets.
- Our homes to switch ON and OFF different devices.(Example:-Water pump)

CONNECTIONS:

The output of the power supply which is 5v is connected to the 40 pin of MC & GND is connected to its 20 pin. Pin's 1 to 6 of MC are given to 1,3,5,8,10,12 pin's of inverter IC 74LS04 & the output pins of the inverter IC 2,4,6,9,11,13 are given to input pins of 1,2,3,4,5,6 of relay driver IC. ULN2003A. Pin 14 of 74LS04 and 9 of ULN2003A^[4] are given to 5v supply. Pin 7 of 74LS04 and 8 of ULN2003A are given to GND. Pin's 15 & 10 of ULN2003A are given to relay's. Pin's 11 to 14 of MC are given to Rows A, B, C, D of Matrix keypad. Pin's 15 to 17 of MC are given to 1, 2, 3 column's of keypad. Pin's 3, 4 of RTC IC DS1307^[3] are given to 3v battery. Pin 1,2 of IC DS1307 are given to Crystal Oscillator 32.788KHz Pin's of MC. Pin's 7,8 of IC DS1307 are given to collector of Transistor Q₄ that drive's fourth seven segment display. Pin's 26 to 32 of MC are given to bare terminals of transistor's Q₁ to Q₄. Pin's 33 to 39 of MC are given to anodes of multiple seven segment display.

WORKING:

The project uses one real time clock IC DS1307 i.e., Interface to the MC pin 27 & 28. A matrix keypad is used for setting the time, relay ON time & OFF time. The relay is driven by pin 25 of MC through driving transistor BC547^[1]. Seven segment LEDs are parallel connected to Port 0 through driving transistors four numbers BC547 to the respective, anode of seven

segment LED display as per the operation of which is explained above

PROGRAM CODE STEPS:

1. Click on the Keil Vision Icon on Desktop
2. Click on the Keil Vision Icon on Desktop
3. Then Click on New Project
4. Save the Project by typing suitable project name with no extension in u r own folder sited in either C:\ or D:\
5. Then Click on Save button above.
6. Select the component for u r project. i.e. Atmel.....
7. Click on the + Symbol beside of Atmel
8. Select AT89C51
9. Then Click on "OK"
10. Then Click either YES or NO.....mostly "NO".
11. Now your project is ready to USE.
12. Now double click on the Target1, you would get another option "Source group 1" as shown in next page.
13. Click on the file option from menu bar and select "new".
14. The next screen will be as shown in next page, and just maximize it by double clicking on its blue boarder.
15. Now start writing program in either in "EMBEDDED C" or "ASM".
16. For a program written in Assembly, then save it with extension ". asm" and for "EMBEDDED C" based program save it with extension ".C"
17. Now right click on Source group 1 and click on "Add files to Group Source".
18. Now you will get another window, on which by default "EMBEDDED C" files will appear.
19. Now select as per your file extension given while saving the file
20. Click only one time on option "ADD".
21. Now Press function key F7 to compile. Any error will appear if so happen.
22. If the file contains no error, then press Control+F5 simultaneously.
23. The new window is as follows
24. Then Click "OK".
25. Now click on the Peripherals from menu bar, and check your required port as shown in fig below
26. Drag the port a side and click in the program file

27. Now keep Pressing function key “F11” slowly and observe.

28. You are running your program successfully.

VI. FUTURE SCOPE

This project could be further extended in which the distribution point can be monitored by one central location. The supply of concerned geographical region is cut off using relays through circuit breaker. In this system to read the remote electrical parameters, user can send commands to concerned DP. This system can send the electrical parameter data like active power, reactive power, current, voltage, frequency etc., in the form of SMS to the user when relay trips. In this type of power system sensors are used to communicate with the microcontroller. Internal memory in the microcontroller helps to hold the assembly code. . Some set of assembly instructions are dumped into the controller using internal memory. Assembly instructions are very important as the operation of the micro-controller is completely dependent on these instructions. This proposed system might takeover manual efforts for controlling the load shedding time break by sending SMS. Power supply cut off of specific zone can be done by just sending an SMS to the concerned Distribution Point from a central point .When the electrical parameters overdo the predefined values these relay will be activated.

CONCLUSION

This project is on the design and construction of an Smart Automatic Load Shedding System. This work presented an enhanced solution to the challenges of poor scheduling of load shedding. The system integrated Light Emitting Diode, Microcontroller, RTC and Relay to automate the load shedding system thereby enhancing the scheduling of load shedding in power distribution stations. The proposed system provides information on the available megawatt from the national grid and the feeders that are on at any particular point in time depending on the supply. The automation of the load shedding system will help in ensuring fairness, accuracy and efficiency in scheduling as human errors are eliminated. Operational cost is also reduced as the life spans of control components are elongated.

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