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Switching Control for Industrial Automation

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ABSTRACT:-
The main function of the project is to switch industrial loads using a programmable logic control device for sequential operation. It means to switch industrial load automatically based on the timer value set means some work in industry may be done for certain period of time continuously and when that work is completed system will automatically switch to subsequent work. In this project we use 8051 microcontroller in place of plc's which are quite expensive. Programmable logic controllers used in industrial applications are very expensive for simple operations like sequential switching of loads. In this project we demonstrate the working of this simple operation using a microcontroller of 8051 family. The development of this application requires the configuration of the program through input switches. In industries, there are many tasks are carried out which requires some repeated operation in various orders and time intervals. For example, certain loads need to be switched ON/OFF in specific time intervals. In order to achieve this, microcontroller is programmed in such a way that the loads a can be operated in three modes: Set mode, Auto mode and Manual mod. In set mode, through timers, the machinery works based on input time set by the user where as in auto mode it works on default time settings and finally in the manual mode it functions while respective switches are pressed depending on the user's need and flexibility. All the modes and status of loads are displayed on an LCD. Thus, tasks performed by costly PLCs can now be achieved using a microcontroller making the device cost effective In implementation of this project we used RTC instead of 8051 timer, which is used to set timing value for each operation.

Keywords:- Sequential, Implementation, Microcontroller, RTC (Real Time Clock)

1. INTRODUCTION

The concept of this research work is to automatically switch industrial load depending on demand/timing value set. Means there is no need to manually change the operation every time**.**
The heart of the project is microcontroller 8051. In this project, the clock plays an important role, where it is used in the following mode i.e., the set mode, auto mode and manual mode for controlling different machines.

1.1 Why to Use Microcontroller PLC are in fact expensive. Here we are using a low cost PLC using simple microcontroller. Normally Plc's have their own dedicated software and program needs to be written in ladder diagram. For this project we have replaced expensive plc with 8051 microcontroller which is inexpensive, in industries some task needs to be repeated in certain period of time. For example, certain loads need to be switched ON/OFF in specific time intervals. To achieve this microcontroller is programmed to work in three modes set mode, default mode and automatic mode.

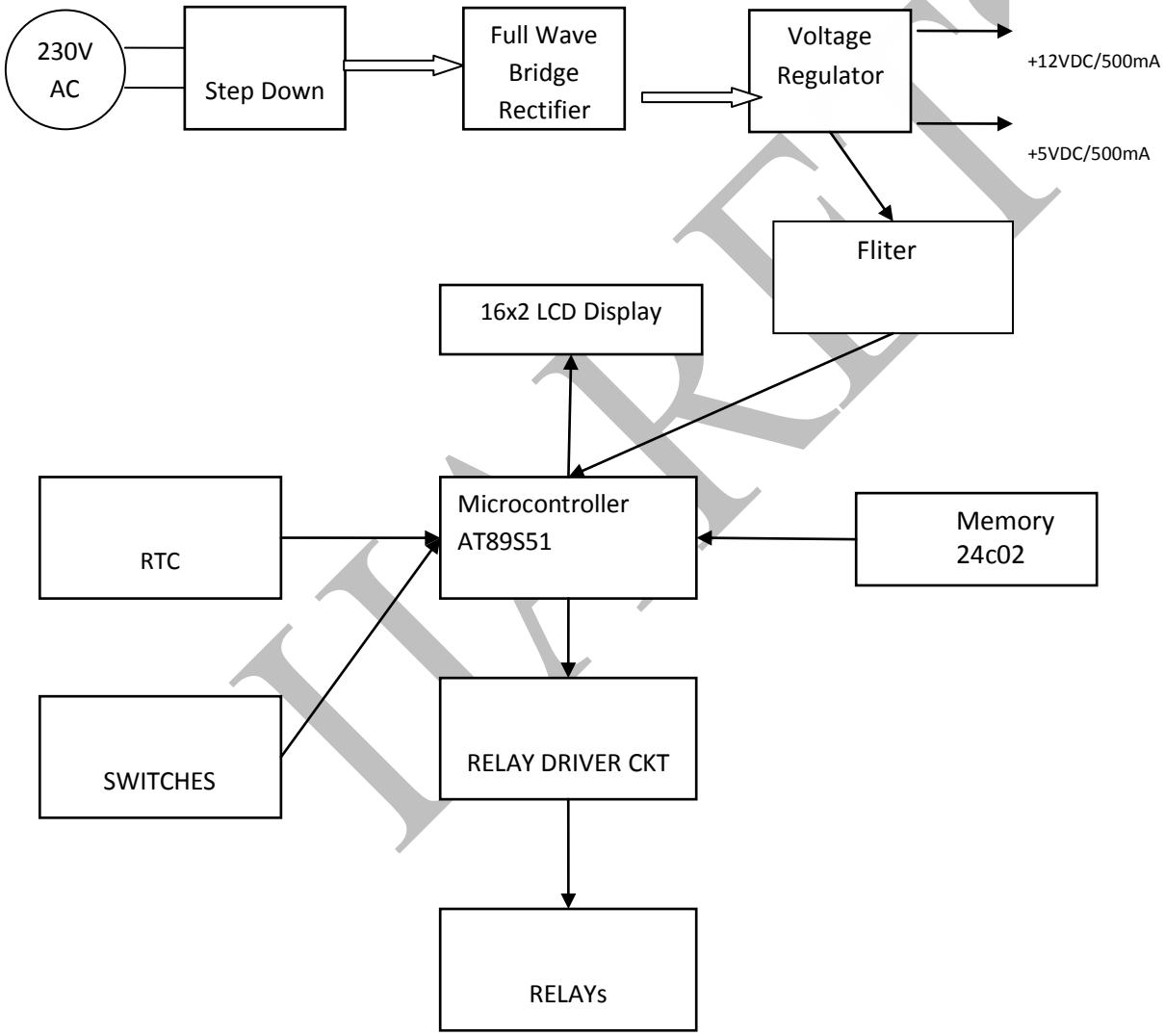
1.2 Modes In set mode, with the help of digital clock the machinery will run based on/off and on time and we know that in auto mode machines will run by default settings and finally in the manual mode the real-time systems used extensively in industrial control applications can run according to the user's need and flexibility.

1.3 RTC In this system RTC is used to provide timing intervals and date. In the Embedded system's clock any time and date can stored on which operation can be shifted. So it is the type of system which are useful in shifting different task in industries. After the specified time period system will shift to next operation. In set mode time interval can be changed and this changed time will
be stored in external memory. This memory is non-volatile and retains its data for a long time. Time is automatically adjusted by the RTC IC with a small battery backup to save the clock setting.

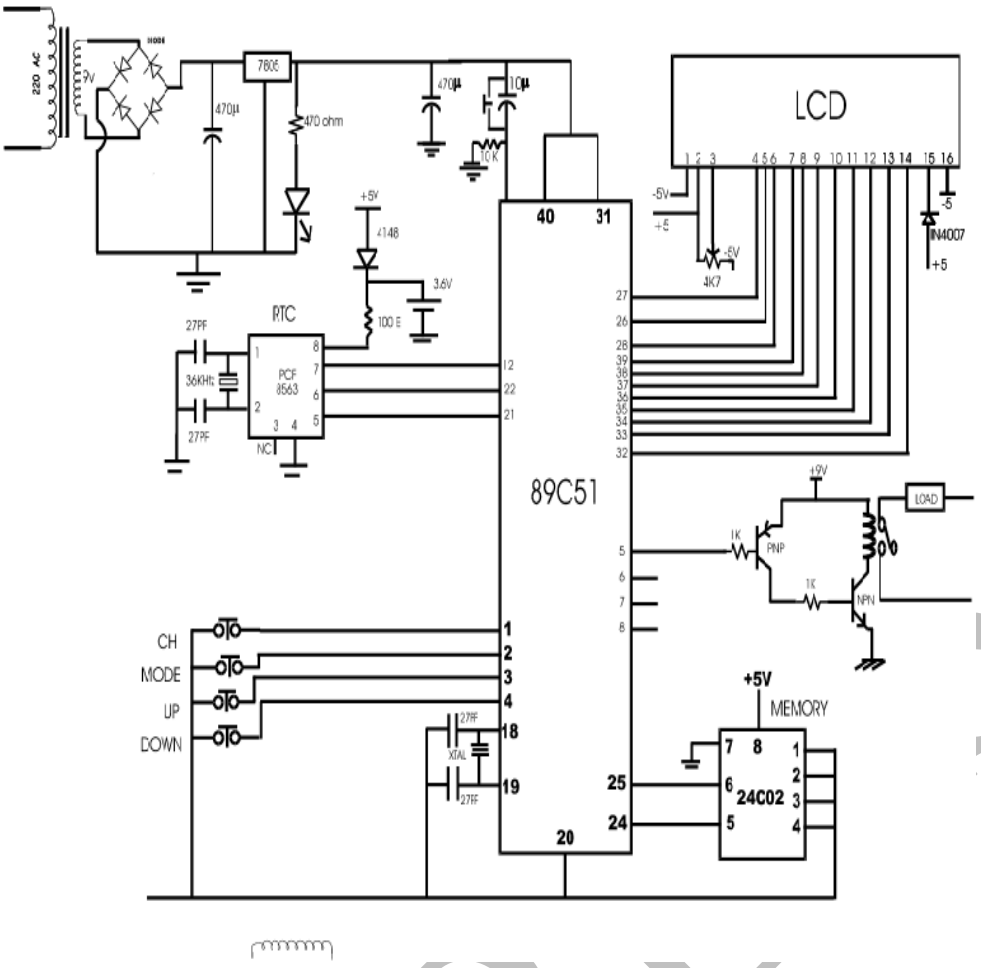
1.4 Power supply The power supply is due to the step down transformer 230/12V. It steps down the voltage to 12V AC. It is to be converted to DC with the help of Bridge rectifier. The ripples are removed by a capacitive filter. It is then regulated to +5V using a voltage regulator 7805. It is required for the operation of the microcontroller and other components. As we know that microcontroller works on +5v. So we required +5V supply which is done with the help of above explained procedure.

2. Diagram

2.1Block Diagram



2.2Circuit Diagram



3. HARDWARE IMPLEMENTATION:-

First of all we take the step down transformer which transfers the 220v to 9v. Then Bridge rectifier is used. It converts the ac to dc. Then voltage regulator IC7805 is implemented which is used for regulating the voltage to 5v. Capacitive filter is used after that which removes the ripples and noise. The Heart of our project is microcontroller. We are using the series of microcontroller 8051. RTC is used which counter the timer control of the microcontroller. Crystal oscillator is used which is of 12mhz to drive the microcontroller. One switch is used for resetting the microcontroller. LCD 16x2 is used. Voltage (5v) is given to it because LCD works on 5V dc. Memory IC24c02 is used for saving the data. Darlington pair is used for drive the relays. Relays of 12v each is used after that. 4 switches are used for the different purposes. One switch is used for setting mode. One switch is used for changing the channel. The last two switches are used for the increment and decrement the values. Four Darlington pairs are used.

Features of microcontroller used are:-

3.1 Microcontroller

1. On chip Oscillator.
2. 4kb of on chip ROM.
3. 128-bytes of on chip RAM.

4. 32 programmable I/O lines.
5. 6 interrupt sources.
6. Timer counter is also on chip.
7. Full duplex serial port is also on chip.

3 .2Comparison between Microcontroller and Plc

1. Plc as we know works with power and microcontroller works with electronic.
2. Microcontroller works with the transistors (also electronic relays) where as Plc works with the relays.
3. Microcontrollers are very easier to implement than a series of PLC.
4. Microcontrollers are cost efficient than PLC.
5. A microcontroller is also a logic controller but used in dedicated systems which are programmed once and for all, the program for which will not be accessed by the user, and whose program will not need to be altered frequently.
6. A microcontroller works only on low voltage DC where as PlCs works on both the AC and DC.
7. We can use Embedded C language in Microcontroller but not in PLC.
8. Microcontrollers are special types of processor chips that are small and somewhat flexible due to programmable nature.
9. As microcontroller are fully integrated onto one chip these device are cheap to manufacture.

4. Future scope and Conclusion

In future our project can be enhanced by interfacing it with a GSM modem. In that by sending an SMS remotely to the control system we can select the mode and timing. Our proposed project is designed in such a way that it overcomes the use of high cost PLCs in industrial automation.
By studying the working of transformers and relay one can easily device new circuitry with some research work. It gives a detailed knowledge of each and every element attached in the circuit.

It can be used in the traffic control signals and also be used in the elevators working. It can be used to automatic shift the load. It prevents the system form damaging. As PLCs are used in the glass, cement and steel industry. Microcontroller is the best replacement in these industries.

Project Result:-

REFRENCES

1. Guo, L. (2009) "Design Projects in a Programmable Logic Controller (PLC) Course in Electrical Engineering Technology" The Technology Interface Journal 10, (1).
2. Hughes, T. A. (2001). Programmable Controllers, Third Edition, the Instrumentation, Systems, and Automation Society - ISA, Volume EMC 64.01
3. Ahmad Fouad Alwan (2009). Fundamentals of Programmable Logic Controller - PLC (1 st Edition) - Dar Al-Uns for Printing and Publishing and Distribution, Damascus, Syria.
4. Siemens Technical Education Program - Basics of PLC's.
5. Bolton, W. (2006), Programmable Logic Controllers, Fourth Edition, Published by Elsevier Newnes.