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Time Delay Generation in an 8085 Microprocessor Using Silicon Controlled Rectifier (SCR)

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Abstract: *This manuscript presents the design and implementation of a time delay system using the 8085 microprocessor and a Silicon Controlled Rectifier (SCR). The work investigates the integration of microprocessor-based digital control with power electronic switching devices for generating controlled delay operations. The 8085 microprocessor provides programmable timing control, while the SCR acts as an electronic switching component for load activation. A Digital-to-Analog Converter (DAC) interface is incorporated to facilitate signal processing and control functionality. The study demonstrates the working principle, architecture, interfacing methodology, and experimental implementation of the delay circuit using the 2N5060 SCR. The proposed system offers a simple and cost-effective solution for delay generation and switching applications in embedded electronics and industrial control systems*

Keywords: 8085 microprocessor, SCR, Silicon Controlled Rectifier, DAC, time delay, embedded systems, power electronics

I. INTRODUCTION

Microprocessors play a significant role in modern electronic systems due to their programmability, reliability, and ease of interfacing with peripheral devices. The Intel 8085 microprocessor is one of the most widely studied and implemented 8-bit microprocessors because of its simple architecture and efficient instruction set.

Time delay circuits are essential in automation, industrial control systems, switching operations, and sequential logic applications. Conventional delay circuits based on resistor-capacitor networks often suffer from limited precision and poor flexibility. Microprocessor-based delay systems overcome these limitations by enabling programmable timing operations.

The Silicon Controlled Rectifier (SCR) is a semiconductor switching device widely used in power control applications. By combining the programmable features of the 8085 microprocessor with the switching capability of the SCR, an efficient delay generation system can be developed.

This work focuses on implementing a programmable time delay system using the 8085 microprocessor and a 2N5060 SCR. The DAC interface is employed to support analog control and timing operations.

II. ARCHITECTURE OF THE 8085 MICROPROCESSOR

The 8085 microprocessor is an 8-bit microprocessor developed by Intel. It consists of several functional units that perform arithmetic, logical, and control operations.

2.1 Accumulator

The accumulator is an 8-bit register used for arithmetic and logical operations. It stores intermediate and final results during program execution.

2.2 Registers

The 8085 contains six general-purpose registers: B, C, D, E, H, and L. These can be combined as register pairs BC, DE, and HL for 16-bit operations.

2.3 Program Counter

The program counter is a 16-bit register that stores the address of the next instruction to be executed.

2.4 Stack Pointer
The stack pointer manages stack operations and stores temporary data and return addresses during subroutine execution.

2.5 Instruction Register
The instruction register holds the current instruction being executed and assists in instruction decoding.

2.6 Flag Register
The flag register stores status flags such as Carry, Zero, Sign, and Parity flags that indicate the result of arithmetic and logical operations.

2.7 Data Bus
The data bus is an 8-bit bidirectional bus used for data transfer between the processor, memory, and peripherals.

2.8 Address Bus
The address bus carries memory addresses and enables communication with memory locations and input/output devices.

2.9 Control Bus
The control bus carries timing and control signals required for synchronization and coordination of system operations.

III. DIGITAL-TO-ANALOG CONVERTER (DAC)
A Digital-to-Analog Converter converts digital binary data into corresponding analog voltage or current signals. DACs are extensively used in process control, instrumentation, communication systems, and microprocessor interfacing.

3.1 Basic Working Principle
The DAC accepts digital input from the microprocessor and produces an equivalent analog output proportional to the digital value. The output voltage is determined by the binary input applied to the converter.

3.2 DAC Interfacing with the 8085
The DAC is interfaced with the 8085 microprocessor through output ports. The processor sends digital values to the DAC, which converts them into analog signals used for triggering or controlling external devices.
In this work, the DAC contributes to timing and signal conditioning operations within the SCR triggering circuit.

IV. SILICON CONTROLLED RECTIFIER (SCR)
The Silicon Controlled Rectifier is a four-layer semiconductor device with three terminals: anode, cathode, and gate. It functions as a controlled electronic switch.

4.1 Working Principle
The SCR remains in the OFF state until a triggering pulse is applied to the gate terminal. Once triggered, the SCR enters the conducting state and continues conduction until the current falls below the holding current.

4.2 V-I Characteristics of SCR
The V-I characteristics of the SCR include:
Forward blocking region
Forward conduction region
Reverse blocking region
The SCR switches from the forward blocking state to the conduction state when the gate trigger current is applied.

4.3 2N5060 SCR
The 2N5060 SCR is a low-power silicon controlled rectifier suitable for switching and triggering applications. It is commonly used in delay circuits, pulse generators, and low-current control systems.

V. EXPERIMENTAL METHODOLOGY

5.1 Objective

To design and implement a programmable time delay system using the 8085 microprocessor and 2N5060 SCR.

5.2 Components Used

8085 Microprocessor kit
2N5060 SCR
Digital-to-Analog Converter (DAC)
Resistors and capacitors
Power supply
Connecting wires and interfacing circuits

5.3 Procedure

The 8085 microprocessor kit was initialized.
The DAC interface circuit was connected to the output port.
The SCR triggering circuit using the 2N5060 SCR was assembled.
A delay program was written and executed in the 8085 microprocessor.
The DAC output signal was applied to the SCR gate.
Time delay operation and switching response were observed and recorded.

VI. WORKING OF THE TIME DELAY CIRCUIT

The microprocessor executes a delay program that generates timing pulses at predetermined intervals. The digital output from the processor is fed into the DAC, which converts it into an analog triggering signal.
The analog signal is applied to the gate terminal of the SCR. After the programmed delay interval, the SCR is triggered and switches the connected load into the ON state.
The delay duration can be modified by altering the program instructions and loop counts in the microprocessor program.

VII. PROGRAM LOGIC

The delay program in the 8085 microprocessor is based on loop counting and register decrement operations. The processor continuously executes instructions until the required delay interval is achieved.
Typical operations involved include:
Loading register values
Decrementing counters
Conditional branching
Output port control
The generated output signal activates the DAC and triggers the SCR after the specified delay period.

VIII. RESULTS AND DISCUSSION

The experimental setup successfully demonstrated programmable time delay generation using the 8085 microprocessor and SCR.
The following observations were made:
The delay interval could be controlled accurately through software programming.
The SCR switching operation was stable and reliable.
The DAC improved the triggering control characteristics.
The system exhibited good repeatability and operational consistency.

The implementation demonstrates the practical application of microprocessor interfacing with power electronic devices for timing and automation purposes.

IX. APPLICATIONS

The proposed system can be used in:

- Industrial automation systems
- Sequential switching circuits
- Motor control applications
- Timer-based electronic devices
- Embedded control systems
- Power electronic triggering circuits

X. CONCLUSION

A programmable time delay system using the 8085 microprocessor and 2N5060 SCR was successfully designed and implemented. The system demonstrated efficient timing control and reliable SCR switching operation. The use of a DAC improved signal interfacing and triggering accuracy.

The work highlights the importance of combining microprocessor technology with power electronic devices for developing flexible and programmable control systems. The proposed method is economical, simple to implement, and suitable for educational as well as industrial applications.

REFERENCES

[1]. Gaonkar, R. S., *Microprocessor Architecture, Programming and Applications with the 8085*, Penram International Publishing.
[2]. Ram, B., *Fundamentals of Microprocessors and Microcomputers*, Dhanpat Rai Publications.
[3]. Malvino, A. P., *Digital Computer Electronics*, Tata McGraw-Hill.
[4]. Muhammad H. Rashid, *Power Electronics: Circuits, Devices and Applications*, Pearson Education.
[5]. Sedra, A. S., and Smith, K. C., *Microelectronic Circuits*, Oxford University Press.
[6]. Intel Corporation, *8085 Microprocessor User Manual*.
[7]. Boylestad, R., *Electronic Devices and Circuit Theory*, Pearson Education.