Princess Sumaya University for Technology
Computer Engineering Department
22440: Microprocessor Lab

Experiment 6: Programmable Interval Timer 8254

Introduction:

The 8254 is a counter/timer device designed to serve the common timing control in microprocessor system design. It can be used as real time clock, event counter, digital one shot, programmable rate generator, and square wave generator. The timer provides three independent 16-bit counters as shown in Figure 1.

The data bus buffer is a tri-state, bi-directional, 8-bit buffer which is used to interface to the system bus. The read/write logic accepts inputs from the system bus and generates control signals for other function blocks of the 8284.

RD\ and WR\ are active low inputs indicate the CPU read and write operations respectively. Both of them are qualified by CS\. A1 and A0 select one of the three counters or the control word register to read from/written into the 8254 as shown below:

A1	A0	Function
0	0	Counter 0
0	1	Counter 1
1	0	Counter 2
1	1	Control Word
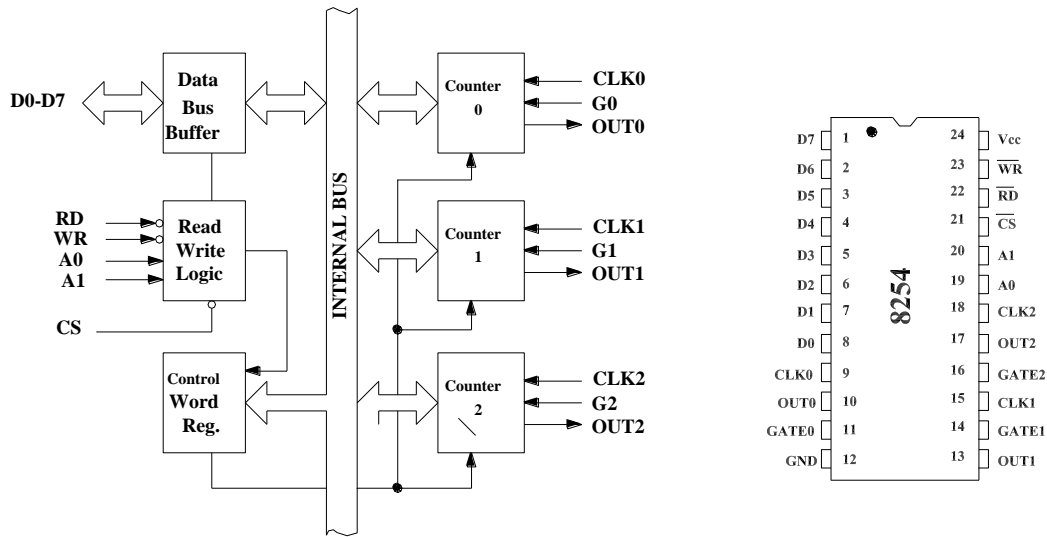
Figure1: The block diagram and pin configuration of 8254

Control Word Format

D7	D6	D5	D4	D3	D2	D1	D0
SC1	SC0	RW1	RW0	M2	M1	M0	BCD

SC1 SC0: Selects counter:

          00 = counter0

          01 = counter1

          10 = counter2

          11 = read back command

RW1 RW0: Read/Write control

          00 = counter latch command

          01 = read/write least significant byte only

          10 = read/write most significant byte only

          11 = read/write least significant byte first, followed by the most significant

M2 M1 M0: Selects the mode (mode0.. mode5)

BCD: Selects a BCD when a logic 1

Lab Assignment

1. Using counter 0 in mode 3:

    *   Write a program to generate a 2KHz square wave at OUT0, if the CLK input to counter 0 = 2MHz, use the function generator to get the CLK signal.
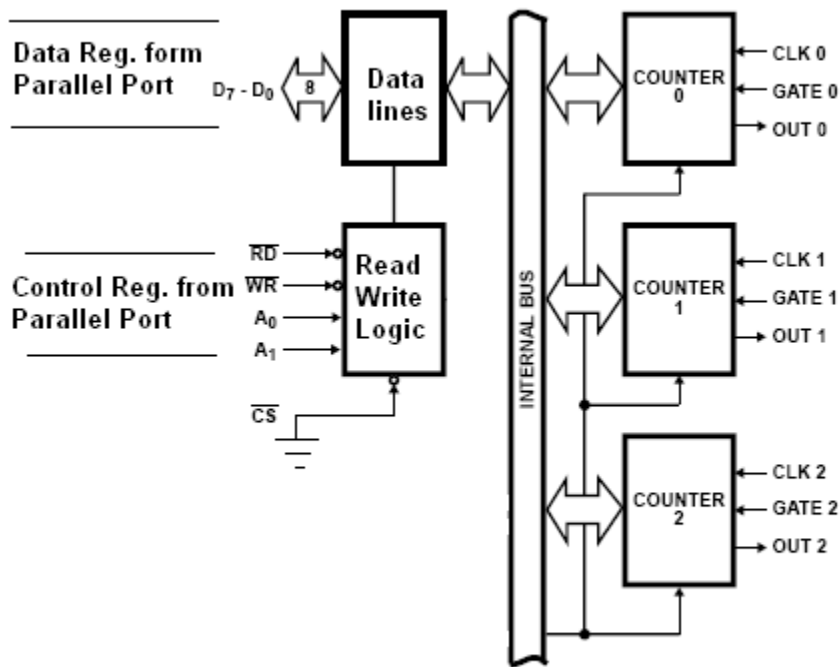   *   Modify your program to generate a 0.5KHz square wave.

Figure 2: The 8254 circuit

2. Using all three counters programmed in mode 3, design a 2KHz tone turned on and off at a 1-sec rate.

    Hint:

    *   Cascade counter1 and counter2 to generate a square wave of 0.5Hz frequency

    *   Program counter 0 to generate 2KHz (CLK 0 = 2MHz), and connect the Gate input (Gate 0) to the 0.5Hz out of the above step.