11. Interfacing Program of Timer [8254] using Microcontroller

11.1 Introduction:

To interface a programmable timer interface with a 8086 trainer kit and to operate it in various modes.

11.2 Hardware requirement

The 8051 Microprocessor kit, Programmable Timer interface add on card, interface cable, Power Supply.

11.3 Theory

The main features of 8253 are as follows:
1. Three independent 16 bit counters
2. Input clock
3. Programmable counter modes

The clk0 can be connected either to the pclk or to the debounce circuit. Using the debounce circuit we can generate a pulse and clock the timer. Similarly clock1 can be connected to pclk and clock2 can be connected to either pclk or out0. In a microprocessor based application, interrupting the processor after a time delay is essential which is achieved using a timer.

11.3.1 Mode 0 – Interrupt on terminal count

The output will be initially low after mode set operation. After loading the counter, the output will remain low while counting and on terminal count the output will become high, until reloaded again. Channel 0 is in mode 0 and the program is executed. Output is observed through a CRO.

11.3.2 Mode 1 – Programmable one shot

After loading the counter, the output will remain low following the rising edge of the gate input. The output will go high on the terminal count. It is retriggerable, hence the output will remain low for the full count after the rising edge of the gate input.
Execute the program, give the clock pulses through the debounce logic and observe the output at the CRO.

11.3.3 Mode 2 – Rate generator

It is a divide by N counter. The output will be low for for one period of the clock input. The period from one output pulse to the next equals the number of input counts in the count register. In the CRO observe the input at channel 1 and the output at out1.

11.3.4 Mode 3 – Square Wave Generator

It is similar to mode 2 except that the output will remain high for one half of the count and go low for the other half for even number count. If the count is odd, the output will remain high for (count-1)/2 counts.

11.3.5 Mode 4 – Software triggered strobe

In this method , the output is high after mode is set and also during counting. On terminal count , the output will go low for one clock period and becomes high again. This mode is used for interrupt generation.

SQUARE WAVE GENERATION MODE

ADDRESS	LABEL	MNEMONICS	OPCODE	COMMENT
		MOV DPTR, #FFCE		
		MOV A, #36		
		MOVX @DPTR, A		
		MOV A, #0A		
		MOV DPTR, #FFC8		
		MOVX @DPTR, A		
		MOV A, #00		
		MOVX @DPTR, A		
	HERE:	SJMP HERE		

Pre Lab:

1. Write the need of 8251 timer.
2. Explain the control word format of 8254.
3. Define Read back operation in 8254.

Post Lab:

1. Design a programmable timer using 8254 and 8086. Interface 8254 at an address 0040H for counter 0 and write the following ALPs. The 8086 and 8254 run at 6MHz and 1.5MHz respectively.
   (i) To generate a square wave of period 1ms.
   (ii) To interrupt the processor after 10ms.