EE 381 : EE LABORATORIES (DIGITAL CIRCUITS AND MICROPROCESSORS)
2017-2018/II

EXPERIMENT 5 : INTERFACE EXPERIMENTS USING DUAL DAC CARD OF THE 8085 MICROPROCESSOR KIT

Introduction

The aim of this experiment is to do some basic operations using the Dual DAC Interface Card of the MPS 85-3 8085 Microprocessor Kit.

PART A DUAL DAC INTERFACE CARD

The MPS 85-3 8085 Microprocessor kit has a Dual DAC interface for generating software controlled voltages through the on board 8255 PPI. 8255 ports are accessible through a 26-pin FRC connector. We shall use the Dual DAC Interface Card to generate different waveforms under program control. Major features of this Dual DAC Interface Card are given below.

(i) The board has two eight bit digital to analog converters based on the DAC 0800 chip. The digital inputs to these DACs are provided through Ports A and B of the 8255. The analog outputs from the DACs are given to operational amplifiers which act as current to voltage converters.

(ii) The reference voltage required for the DACs is obtained from an onboard μA723 voltage regulator chip. The regulator output is designed to give about +8V output. The outputs from the DACs vary between 0 to 5V corresponding to the input data range from 00H and FFH.

(iii) The Dual DAC interface card is physically connected to Port A and Port B of 8255. Ports A and B are to be programmed as Mode 0, output ports.

(iv) The outputs of the DACs are available at the two opamp outputs, marked as Xout and Yout. A byte output at Port A generates Xout, while Port B byte generates Yout.

(v) 8255 Port adresses are: Port A : 40H ; Port B : 41H ; Port C : 42H ; Control Reg : 43H

(vi) The interface card requires +12V and -12V supplies which are connected to the card using a 4-pin connector provided.

Using the above features of the Dual DAC card one can generate a variety of waveforms.

PART B: WAVEFORM GENERATION UNDER SOFTWARE CONTROL

Note: In all your programs at the very beginning itself initialize Port A and Port B as Mode 0 Output ports. Port C may be made input or output port (as Port C is not connected to the card). Commands MVI A,h'80 ; OUT h'43 will make Port A, B and C as outputs.

1. Program 1: SAMPLE PROGRAM

A sample program is given below which generates identical waveforms on Xout and Yout test points of the Card. Make suitable changes to this program for the other programs of the experiment. Observe Xout or Yout waveform on the CRO. Sketch the waveform and note the salient voltage levels of the same. What is the frequency of the waveform?

ADDRESS	OPCODE			LABEL	MNEMONIC	COMMENTS
8C00	3E	80			MVI A,H'80	;Initialize 8255 for ;mode 0
8C02	D3	43			OUT H'43	;Port A & Port B output ports
8C04	AF				XRA A	;Starts with a value 00H
8C05	D3	40		LOOP1 :	OUT PORTA	;Out to DAC 1
8C07	D3	41			OUT PORTB	;Out to DAC 2
8C09	3C				INR A	;Increment the DAC input
8C0A	FE	FF			CPI H'FF	;Has the Peak value been

						reached
8C0C	C2	05	8C		JNZ LOOP1	;No, loop back
8C0F	D3	40		LOOP2 :	OUT PORTA	;Out to DAC 1
8C11	D3	41			OUT PORTB	;Out to DAC 2
8C13	3D				DCR A	;Decrement the DAC input
8C14	C2	0F	8C		JNZ LOOP2	;Minimum value not reached , loop back
8C17	C3	05	8C		JMP LOOP1	;Repeat for ever

2. PROGRAM 2: LINEARITY TEST FOR THE DUAL DAC

Write a few lines of code to output about 8 values (equally spaced) between 00H and FFH to the DACs. Choose a few extra bytes at the lower and upper ends. Use a DMM to measure the analog outputs corresponding to these bytes. See whether the DAC outputs are linear, especially at the lower and higher ends. Also measure the resolution of the DAC and compare it with the expected value.

3. Program 3: GENERATION OF A SAWTOOTH WAVEFORM

Write a program to generate a sawtooth waveform, going from 0 to 5V. Measure the frequency of the sawtooth waveform. Calculate the frequency value theoretically and compare with the frequency value obtained experimentally.

4. Program 4: GENERATION OF SINE AND COSINE WAVEFORMS

(a) Write a program which will generate one cycle of a sine wave on Xout and a cosine wave on Yout. Run your program and observe the outputs. Sketch them noting the salient voltage levels.
(b) Using X-Y display mode of the CRO observe the resultant waveform.

OPTIONAL

5. Program 5: LISSAJOUS FIGURES USING THE DUAL DAC CARD

Write programs which will result in different Lissajous figures (by generating sine and cosine waveforms, with repetition rates of Xout *n* times that of Yout).

DUAL DAC INTERFACE BOARD LAYOUT