Experiment-6

Interfacing ADC and DAC to 8086

Date: 21/11/24

6. a) Digital to Analog Conversion

OBJECTIVE

To write an ALP to convert digital to analog signal

Generate the following wave forms

a. Square wave form

b. Saw-tooth waveform

c. Triangular waveform

APPARATUS

8086 Trainer.,Power supply for trainer and interface module.,ADC& DAC interface module,Power mate connector.5. FRC connector.6. Cathode ray oscilloscope.

PROCEDURE

- Connect 8086 kit to PC using RS232cable.
- Connect Power supply to 8086 kit and ADC&DAC interfacing kit(only blue(+5v) and black(0v) lines Power cable to power supply)
- Connect 8255 to CN4 of 8086 using 26 pin bus.
- Connect the CRO probe to ADC&DAC Kit output pin
- Keep the DIP switch in 1 & 7 on (8086kit), open TALK, and go to options select target device as 8086 and Connect.

- Change DIP switch as 1 & 5ON and reset 8086 kit once.
- Go to file ?Download hex file
- Press G-5000(on Kit keyboard), we can observe the output on CRO.

DIGITAL TO ANALOG CONVERSION INTERFACING DIAGRAM

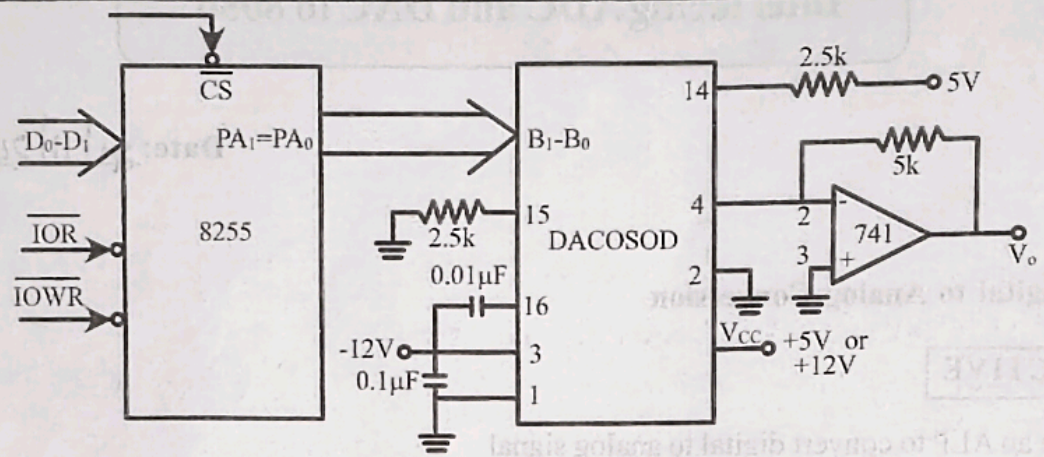


Figure-1: *Digital to analog conversion Interfacing*

PROGRAM TO GENERATE SQUARE WAVE

MEMORY LOCATION	OPCODE	LABEL	OPERATIONS
			MOV AL,80
			MOV DX,OFFC6
			OUT DX
		AO:	MOV DX,OFFC2
			OUT DX
			CALL DELAY1
			MOV AL,OFF
			OUT DX
			CALL DELAY2
			JMP AO

DELAY PROGRAM 1

ADDRESS	OPCODE	LABEL	OPERATIONS
			MOV CX,0020
		A1:	LOOP A1
			RET

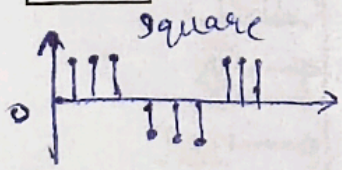
DELAY PROGRAM 2

ADDRESS	OPCODE	LABEL	OPERATIONS
			MOV CX, 0020
		A2	LOOP A2
			RET

PROGRAM TO GENERATE SAWTOOTH WAVE

ADDRESS	OPCODE	LABEL	OPERATIONS
			MOV AL, 80
			MOV DX, 0FFC6
			OUT DX,
		L2	MOV DX, 0FFC2
			MOV AL, 00
		L1	OUT DX.
			INC AL
			CMP AL, 0FF
			JB L1
			OUT DX
			JMP L2

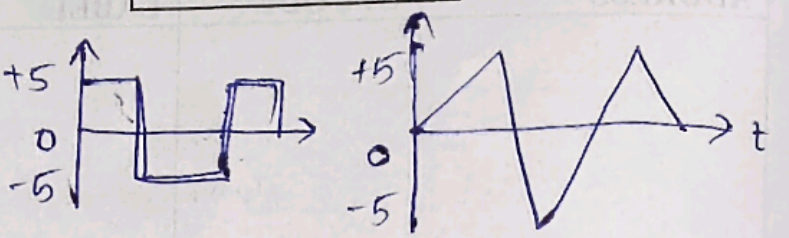
INPUT **OUTPUT**



POWER SUPPLY

+5V

DISPLAY SHOWS



CHANNEL NO

RESULT

An ADP to convert digital to analog signal is executed.

Experiment-6

(b) Analog to Digital Conversion

Date: 21/11/24

6. (b) Analog to Digital Conversion

OBJECTIVE

To write an ALP to convert Analog signal to Digital signal

APPARATUS

1. 8086 Trainer.
2. Power supply for trainer and interface module.
3. ADC&DAC interface module.
4. Power mate connector.5. FRC connector

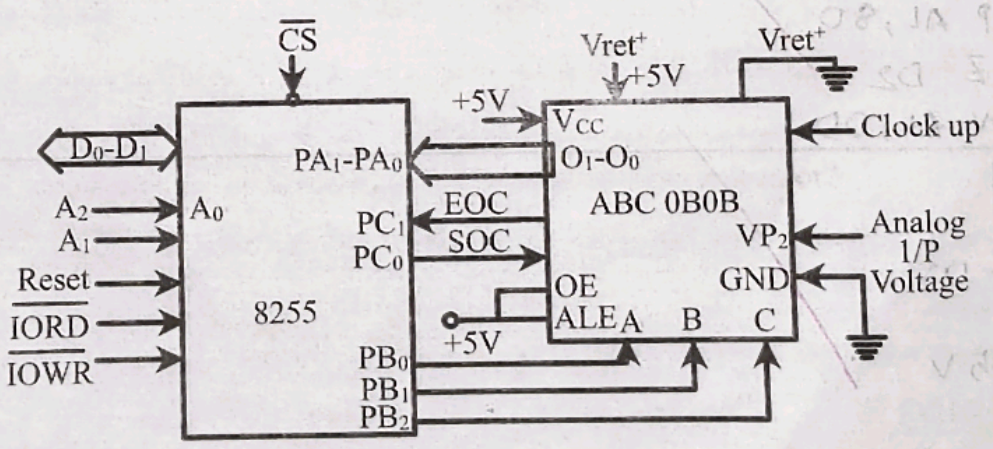


Figure-2: *Analog to digital conversion interfacing diagram*

PROGRAM

```
MOV AL,90
MOV DX,OFFC6
OUT DX
D3 : MOV AL,07
MOV DX,OFFC4
OUT DX
MOV AL,0F
MOV DX,OFFCC
OUT DX
MOV CX,3FFF
LOOP D1
D1: MOV AL,0E
   MOV DX,OFFC6
   OUT DX
   MOV AL,0C
   MOV DX,OFFC6
   OUT DX
   MOV DX,OFFC0
D2 : IN DX
   AND AL,80
   CMP AL,80
   JNZ D2
   MOV AL,0D
   MOV DX,OFFC6
   OUT DX
   MOV DX,OFFC6
   OUT DX
   MOV DX,OFFC6
   IN DX
   MOV DX,OFFC2
   OUT DX
   JMP D3
```

INPUT

i/p - 0V

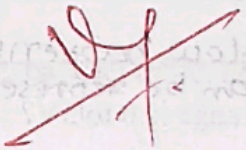
i/p - 5V

OUTPUT

00
FF

RESULT

Hence we written an ALP to convert Analog to digital.



OUTCOME

After completion of this experiment the student will be able to:

1. Find digital equivalent value for analog input voltage using 8086 and ADC.
2. Generate code pattern for giving to ADC for various applications

VIVA QUESTIONS

1. What are the standard clock speeds for 8086?

Ans. The standard clock speeds for 8086 Microprocessor are 5MHz, 8MHz, and 10MHz.

2. What is the duty cycle of the clock to be given to 8086 processor?

Ans. The duty cycle of the clock to be given to 8086 microprocessor is 33% (1/3 high and 2/3 low).

3. How many segments can be arranged in the memory of 8086 and name them?

Ans. 4 segments, they are 1) code segment (CS) 2) Data segment (DS) 3) stack segment (SS) 4) Extra segment (ES).

4. How to generate physical address from the logical address in 8086?

Ans. Shift the segment address left by 4 bits (multiply by 16) and add the offset address. Physical address = (segment x 16) + offset.

5. ASCII stands for what?

Ans. ASCII stands for American standard code for Information Interchange.

6. What are the different I/O interfacing techniques?

Ans. The different I/O interfacing techniques are programmed I/O, Interrupt-driven I/O, and Direct Memory Access (DMA).

7. What is the difference between carry and overflow?

Ans. Carry occurs when an addition exceeds the max. value that can be held in a register, while overflow happens when result of an operation exceeds the range that can be represented by datatype.

8. What is the resolution of an 8 bit DAC whose output range is 0 to 5V?

Ans. The resolution of an 8-bit DAC with a 0 to 5V O/p range is 5V/255 = 0.0196 V (19.6 mV) per step.

9. What is quantization error in ADCs / DACs?

Ans. Quantization error in DACs/ADCs is diff. b/w actual analog o/p value and nearest digital approximation due to finite resolution of converter.

10. What for SOC and EOC signals are used in ADC?

Ans. SOC (Start of conversion) signal initiates the conversion process in an ADC, while EOC (End of conversion) signal indicates that the conversion is complete and the digital o/p is ready.

Experiment-9

Interfacing to 8086 and Programming to Control Stepper Motor

Date: 18/10/24

OBJECTIVE

Write an Assembly Language Program to rotate the Stepper Motor in clockwise as well as anti-clockwise direction.

APPARATUS

8086 Trainer kit, Stepper Motor Interface Card, Stepper Motor and Power Supply.

PROCEDURE

1. Connect the 26 core FRC connector to the 8086 trainer at connector no CN4 and the interface module.
2. Connect the power mate connector to the interface module and the other side of the connector to the power supply. The connections to the power supply are given below.

   Connections: (power supply)

   Black & Red: Gnd.

   Blue & Green: +5V.
3. 5- Way power mate is wired to the motor. This power mate is to be inserted into the male socket provided on the interface. Care should be taken such that, below given code for the particular colored wire coincides with the code on the interface.

   A- GREEN

   C- RED & WHITE

B- GREEN & WHITE

D- RED

VDD- BLACK & WHITE.

4. After the completion of the program and connections enter the program as given in the listing below.

G0< STARTING ADDRESS< ENTER (on the key board of trainer).

INTERFACING DIAGRAM

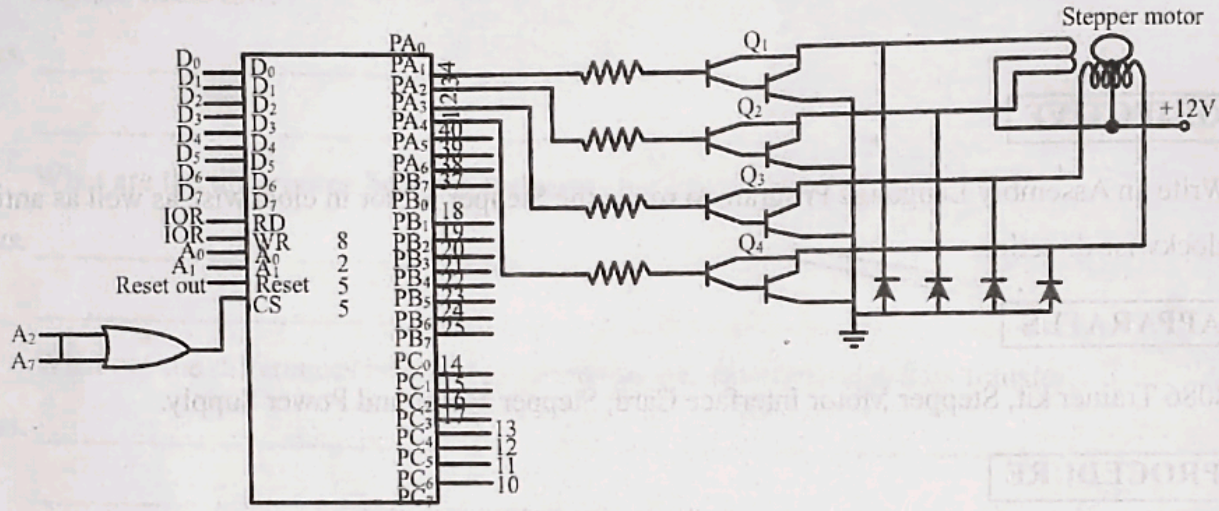


Fig 11.1: Setpper Motor Interfacing Diagram

PROGRAM TO ROTATE IN CLOCKWISE DIRECTION

MEMORY LOCATION	OPCODE	LABEL	OPERATIONS

4000			MOV AL,80
			MOV DX,0FF C6
			Out DX
			MOV BX,02
			MOV DX,0FF
			A2:
			MOV AL,TF
			MOV DX,0FF C4
			Out DX
			A1:
			CALL DELAY
			MOV AL,088
			MOV AX,0FF C4
			Out DX
			CALL DELAY
			MOV AL,000
			MOV Dx,0FF C4
			Out DX
			CALL DISPLAY
			MOV AL,0FF C4
			MOV DX,0FF C4
			OUT DX
			CALL DELAY
			LOOS A1
			DEC DY
			JNZ A2

PROGRAM TO RATATE IN ANTI CLOCK WISE DIRECTION

MEMORY LOCATION	OPCODE	LABEL	OPERATIONS
4000			CSEG segment assume cs: CSEG, DS; DSEG
		startup	test program
		MOV AL	CTL_BYTE
		MOV DX	CTL_PORT
		OUT DX	AL
		start: MOV	AL, phase A;
		phase	G of both
		MOV DX	port C
		OUT DX	AL
		CALL	DELAY
		MOV AL	Phase_C
		MOV DX	port_C

DELAY PROGRAM

MEMORY LOCATION	OPCODE	LABEL	OPERATIONS
			MOV AX, 0500
			NOP
			NOP
		AB:	DEC AX
			JNZ AB
			RET

RESULT

I have written an ALP to rotate the stepper motor in clockwise as well as anti-clockwise direction.

OUTCOME

Upon completion of this experiment the student is able to:

1. Demonstrate the operation of stepper motor both in clockwise and anticlockwise directions.
2. Understand the real time applications of stepper motor.

VIVA QUESTIONS

1. Explain the principle of operation of stepper motor.

Ans. A magnetic field is generated by the current flowing in the coil & the rotor align with this field.

2. How to calculate step angle?

Ans. $\psi = \left(\frac{NS - N\gamma}{NS \times N\gamma}\right) \times 360^\circ$

ψ = step angle
NS = no. of teeth on stator.
$N\gamma$ = no. of teeth on rotor.

3. What is the necessity of driver IC to drive motor?

Ans. A motor driver IC is a power amplifier. Beside it takes a low-power signal from the uc & amplifies it to provide enough power to drive the motor.

4. How to protect windings from back E.M.F?

Ans. Protection or snubber diodes are installed across the motor terminals, opposing the supply voltage. Thus, when the motor turns off, the diode presents a short circuit to the back E.M.F allowed it to dissipate safe.

5. How a freewheeling diode works?

Ans. Free wheeling diode or flyback diode is a diode that is connected across on conductor to eliminate the flyback.

6. Why Four control signals are required for the control of stepper motor?

Ans. Four control signals are required for the controlling a stepper motor, particularly in configurations like the bipolar stepper motor.

7. Why Darlington pair configuration is used for driving the coil of the stepper motor?

Ans. A Darlington pair is used for driving stepper motor coils due to its high current gain, enabling efficient control of large currents with minimal input.

8. What are the main differences between a normal motor and a stepper motor?

Ans. A normal motor operates continuously for variable speed interval, while a stepper moves in precise, discrete steps for accurate positioning

9. Where Stepper motor is required to be used?

Ans. Stepper motors are commonly used in 3D printers, CNC machines, robotic arms etc.,.

10. How many types of two phase stepper motor exist?

Ans. Permanent magnet (PM) stepper motors.
Variable Reluctance (VR) stepper motors.

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