**Lab 7**

**Ex.No.7: DAC and ADC Interface**

**7.1Introduction:**

Write a program to interface a Digital to Analog (DAC) with 8086.

**7.2 Hardware Requirement:**

The 8086 Microprocessor kit, D/A and A/D add on card, interface cable, Power supply.

**7.3 Program Logic:**

The physical quantities like temperature, pressure etc. is required for the electronic circuit for data processing. The electrical equivalents of such parameters are obtained by the use of transducers. It is difficult to process or store the analog values so there is a conversion of analog signals to the digital domain for the ease of processing and again converting it into the analog domain for the real time output. This is of course achieved by the use of converters. The circuit which is used to convert a digital value into a analog value is a digital to analog converter.

**7.3.1 Digital to Analog Converter:**

A digital number can be converted to an analog voltage by selectively adding voltage which is proportional to the weight of each binary digit. The module finds a great use in feedback system, like output of a channel is fed to a control circuit to contain output in the form of signal is observed at an oscilloscope or for a hard copy fed to an X-Y Recorder/X-T Recorder. Different wave forms can be generated by using this DAC-0800 module.

**7.3.2 Circuit description:**

Port A & port B are connected to channel 1 and channel 2 respectively. A reference voltage of 8V is generated using 723 and is given to verify points of the DAC 0800. The standard output voltage will be 7.98V when FF is outputted and will be 0v when 00 is outputted. The output of DAC-0800 is fed to the operational amplifier to get the final output as X out and Y out. Several interesting waveforms can be generated and observed on oscilloscope.

**Hardware installation:**

* Connect DAC-0800 interfacing module to 8255-I of 8085/8051/80865 trainer kit through 26 pin FRC cable.
* Be sure about the direction of the cable i.e. pin No.1 of module should be connected to pin No.1 of 8255 connector.
* Connect +12V, -12V & GND from the trainer kit.

**7.4 PROGRAM:**

**DIGITAL TO ANALOG CONVERTER**

**7.4.1 Square wave generation**

The basic idea behind the generation of the waveform is the continuous generation of analog output at DAC. With 00(hex) as the input to the DAC2, the analog value is -5v. Similarly, with FF (hex) as input, the output of the DAC is +5v. Outputting the digital data 00 and FF at regular intervals at DAC2, results in a square wave generation.

**Program:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ADDRESS** | **LABEL** | **MNEMONICS** | **OPCODE** | **COMMENTS** |
|  |  | MOV AL,00 |  |  |
|  |  | OUT C8,AL |  |  |
|  |  | CALL 1010 |  |  |
|  |  | MOV AL,FF |  |  |
|  |  | OUT C8,AL |  |  |
|  |  | CALL 1010 |  |  |
|  |  | JMP 1000 |  |  |
|  |  | MOV CX, 05FF |  |  |
|  |  | LOOP 1013 |  |  |
|  |  | RET |  |  |

**7.4.2 Sawtooth wave generation**

Output digital data from 00 to FF in constant steps of 01 to DAC1.Repeat this sequence again and again. As a result a saw tooth is generated at DAC1 output.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ADDRESS** | **LABEL** | **MNEMONICS** | **OPCODE** | **COMMENTS** |
|  | **START** | MOV AL,00 |  |  |
|  | **L1** | OUT CO,AL |  |  |
|  |  | INC AL |  |  |
|  |  | JNZ L1 |  |  |
|  |  | JMP START |  |  |

**7.4.3 TRIANGLE WAVE GENERATION**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ADDRESS** | **LABEL** | **MNEMONICS** | **OPCODE** | **COMMENTS** |
|  | **START** | MOV BL,00 |  |  |
|  | **L1** | MOV AL,BL |  |  |
|  |  | OUT C0,AL |  |  |
|  |  | INC BL |  |  |
|  |  | JNZ 1002 |  |  |
|  |  | MOV BL,FF |  |  |
|  | **L2** | MOV AL,BL |  |  |
|  |  | OUT C0,AL |  |  |
|  |  | DEC BL |  |  |
|  |  | JNZ 100C |  |  |
|  |  | JMP 1000 |  |  |

**7.5 Pre-Lab Questions:**

1. Why Analog to Digital conversion?

2. Why DAC is interfaced with 8086?

3. State any two applications where DAC is used?

4. How many waveforms are generated in the program stated above?

5. Is it possible to generate a sine wave using a DAC?

**7.6 Post-Lab Questions:**

1.Write a program to generate a triangular wave

2. Write a general algorithm for interfacing ADC with 8086.

3. Figure shows the interfacing of ADC 0804 to the 8086 microprocessor. Write an assembly language program to read the converted digital data through data bus.

