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MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

T. Y. B. Tech (Electrical and Computer Engineering)

Trimester: V **Subject: Microcontroller and Applications**
Name: Shreerang Mhatre **Class: TY**

Roll No: 52 **Batch: A3**

Experiment No: 05

Name of the Experiment: Interfacing of 8-bit DAC with C8051F340

Performed on: 28/11/2023

Submitted on: 07/11/2023

Marks	Teacher's Signature with date

Aim: Write C program for interfacing of 8 bit DAC with C8051F340 to generate
i) Square wave
ii) Triangular wave

Apparatus: EPBF340 board, DSO, DSO probes, DAC Board

Theory:

The digital to analog converter involves translating digital information to equivalent analog information. DAC 0808 is R-2R ladder DAC giving output analog current so need to convert in voltage. I to V converter is used using LF351.DAC and LF351 require dual power supply of +15V &-15V.

DAC 0808 features:

1. 8 bit digital to analog converter
2. Low power consumption 33mW with ± 5V.
3. Power supply voltage range ± 4.5V to ± 18V.
4. Non-inverting digital inputs are TTL and CMOS compatible.
5. 16 pin DIP.
6. High speed multiplying input slew rate: 8mA/⌠s.
7. Relative accuracy - ± 0.19 % error maximum.
8. Fast settling time: 150 ns typical.
9. Full-scale current match: ± 1 LSB typical.

Applications:

1. Programmable power supply.
2. DC motor speed control.
3. Speed synthesis

Interfacing Diagram:

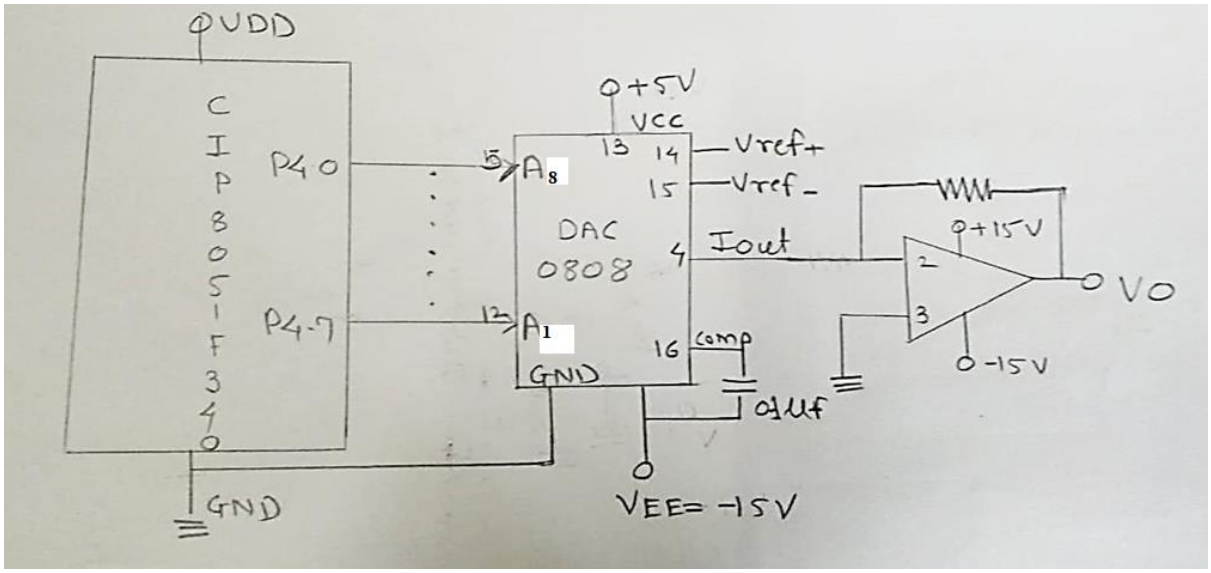


Figure 6.1 Interfacing Diagram of 8-bit DAC with C8051F340

Hardware Connections:

Connect dual power supply of 15V to DAC board. Digital data is available on P4 so Connect flat cable between PL6 connector of EPBF340 board to DAC data lines on DAC board.

Pin Connection	PL6 Connector of EPBF340	Pin Connection	DAC board data lines socket
1			
2			
3			
4	P3.3		
5			
10	P4.0	3	D0
11	P4.1	4	D1
12	P4.2	5	D2
13	P4.3	6	D3
14	P4.4	7	D4

15	P4.5	8	D5
16	P4.6	9	D6
17	P4.7	10	D7
18	3.3 V		NC
19	5.0 V	1	5.0 V
20	GND	**2**	GND

Program: Attach printout of the tested code.

Result:

Observe square and triangular wave on DSO.

Conclusion:

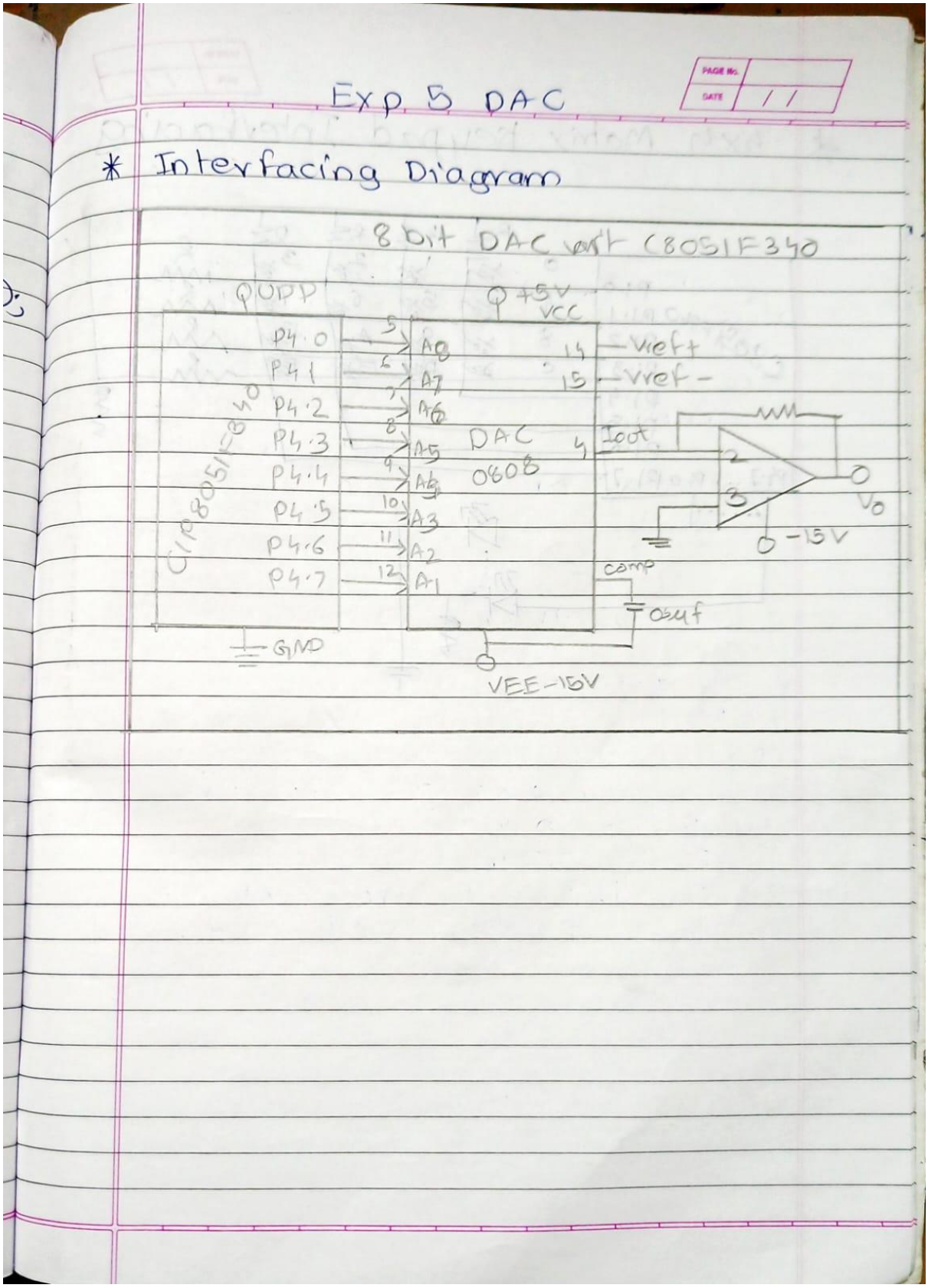
Study Questions:

1. Write a program to generate trapezoidal wave using DAC
2. Explain different types of DAC

Additional Links:

https://nptel.ac.in/courses/112103174/module2/lec8/1.html

Interfacing Diagram of 8-bit DAC with C8051F340



DAC Interfacing with C8051F340 for Square Waveform:

```
// Exp - 5 DAC Interfacing with C8051F340
/*
Name: Shreerang Mhatre
Rollno: 52
Batch: A3
Class: TY

DAC_Square Waveform

*/

#include"c8051f340.h"
void delay(unsigned int Ms);
void main(){
    P4MDOUT=0xff;
    while(1){
        P4=~P4;
        delay(50);
    }
}
void delay(unsigned int Ms){
    unsigned int n;
    unsigned int i;
    for(n=0;n<Ms;n++){
        for(i=0;i<65;i++);
    }
}
```

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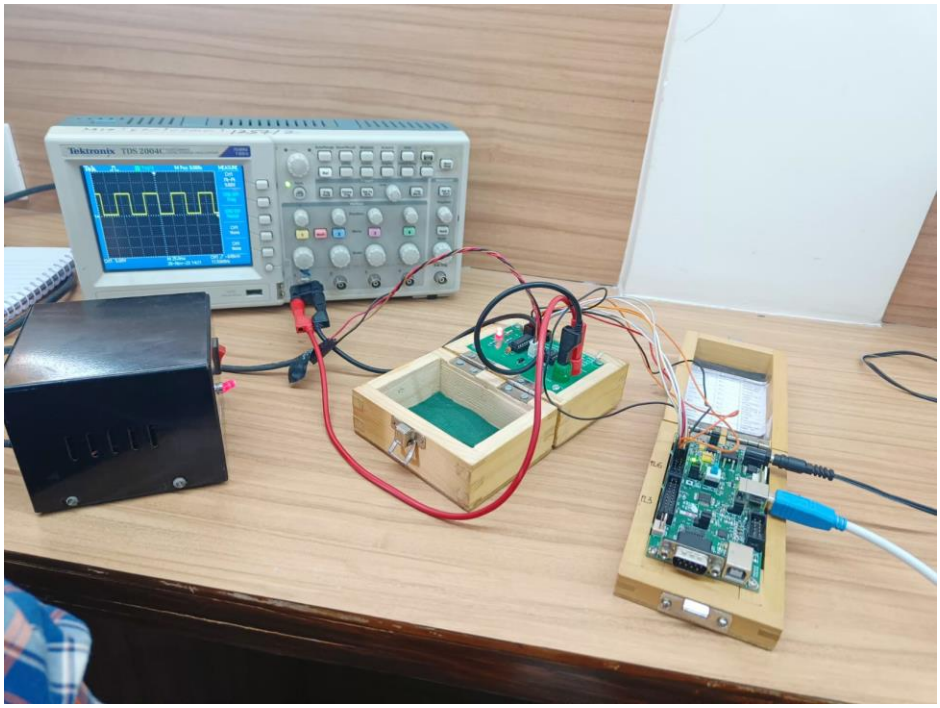
DAC Interfacing with C8051F340 for Triangular Waveform:

```
// Exp - 5 DAC Interfacing with C8051F340
/*
Name: Shreerang Mhatre
Rollno: 52
Batch: A3
Class: TY

DAC_Triangular Waveform

*/
#include"c8051f340.h"
void main(){
    int i;
    P4MDOUT=0xff;
    while(1){
        for(i=0; i<=254;i++){
            P4=i;
        }
        for(i=255; i>=1; i--){
            P4=i;
        }
    }
}
```

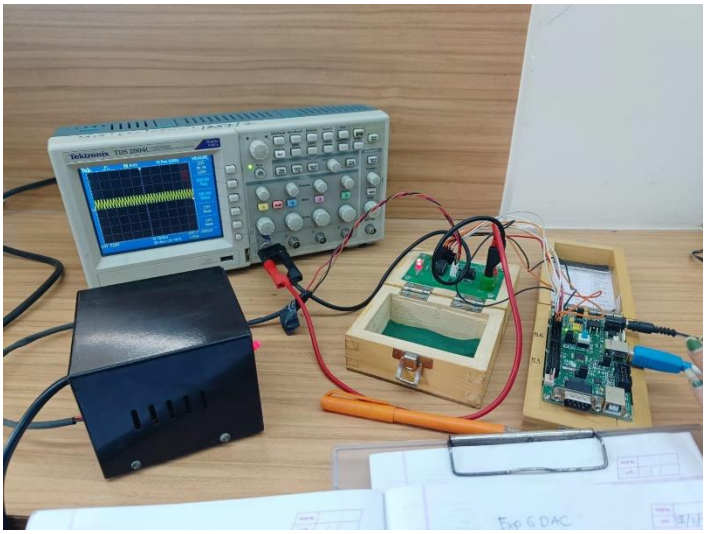
DAC Interfacing with C8051F340 for Sawtooth Waveform:

```
// Exp - 5 DAC Interfacing with C8051F340
/*
Name: Shreerang Mhatre
Rollno: 52
Batch: A3
Class: TY

DAC_Sawtooth Waveform

*/

#include"c8051f340.h"
void main(){
    int i;
    P4MDOUT=0xff;
    while(1){
        for(i=0; i<=254;i++){
            P4=i;
        }

    }
}
```

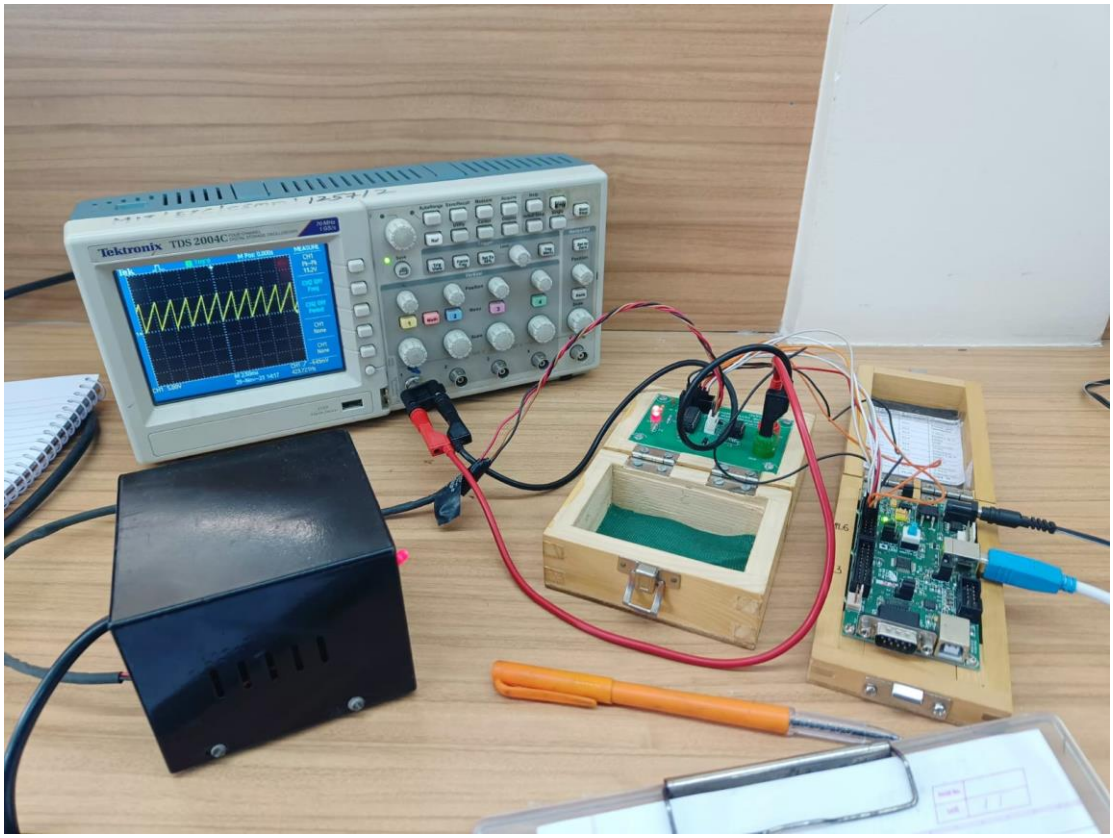
Output for Square Waveform:



Output for Triangular Waveform:



Output for Sawtooth Waveform:



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Exp5 DAC

	Amplitude	frequency	Time period
① square	9.60 V	17.50 Hz	25.0ms
② Triangular (256)	10.2 V	17.8.6 Hz	5.60ms
③ Triangular (128)	5.20 V	110 Hz	10.00ms
④ sawtooth	11.2 V	429.72 Hz	2.50ms

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* Post lab Questions

Q1) Write a program to generate trapezoidal wave using DAC

→

```
# include "C8051F340.h"
Void main () {
  int i;
  P4MDOUT = 0xFF;
  while (1) {
    for (int i=0; i<=254; i++) {
        P4 = i;
    }
    delay (80);
    for (int i=255; i>=1; i--) {
        P4 = i;
    }
    delay(80);
  }
}
Void delay (unsigned int ms) {
  unsigned int n;
  unsigned int i;
  for (n=0; n<ms; n++) {
      for (j=0; j<65; j++);
  }
}
```

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(Q2) Explain different types of DAC.

→ (1) Binary weighted resistor DAC - utilizes a ladder network of resistors
(2) Each bit in digital input contributes to the o/p voltage through a specific resistor.
(3) Precision & linearity depend on resistor matching
(4) R-2R ladder DAC employs a ladder network of resistors in a specific arrangement.

Resistors are in either 2R or R configuration
(1) Segmented DAC (Digital Potentiometer) consists of multiple resistors segments that can be individually switched in or out.
(2) PWM DAC (Sigma delta DAC. converts digital input to analog by averaging the duty cycle of a high frequency pulse train.
(5) Achievers high resolution & good linearity.

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