An-Najah National University
Faculty of Engineering and IT

جامعة النجاح الوطنية
كلية الهندسة وتكنولوجيا المعلومات

Computer Engineering Department

Course Name: Microprocessor Lab Number: 10636392

Lab Report Grading Sheet

Instructor: Dr. Manar Qamhieh.	Experiment #: 8
Academic Year: 2023/2024	Experiment Name: Controlling a DC Motor
Semester: 1 (A)	
Students	
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Performed on: 26/3/2024	Submitted on: 1/4/2024

Report's Outcomes

ILO __ =( ) %	ILO __ =( ) %	ILO __ =( ) %	ILO __ =( ) %	ILO __ =( ) %

Evaluation Criterion	Grade	Points
Abstract answers to the questions: "What did you do? How did you do it? What did you find?"	0.5	
Introduction and Theory Sufficient, clear, and complete statement of objectives. In addition to Presents sufficiently the theoretical basis.	1.5	
Apparatus/ Procedure Apparatus sufficiently described to enable another experimenter to identify the equipment needed to conduct the experiment. Procedure sufficiently described.	2	
Experimental Results and Discussion (In-Lab Worksheet) Crisp explanation of experimental results. Comparison of theoretical predictions to experimental results, including discussion of accuracy and error analysis in some cases.	4	
Conclusions and Recommendations Conclusions summarize the major findings from the experimental results with adequate specificity. Recommendations appropriate considering conclusions. Correct grammar.	1	
Appearance Title page is complete, page numbers applied, content is well organized, correct spelling, fonts are consistent, good visual appeal.	1	
Total	10	

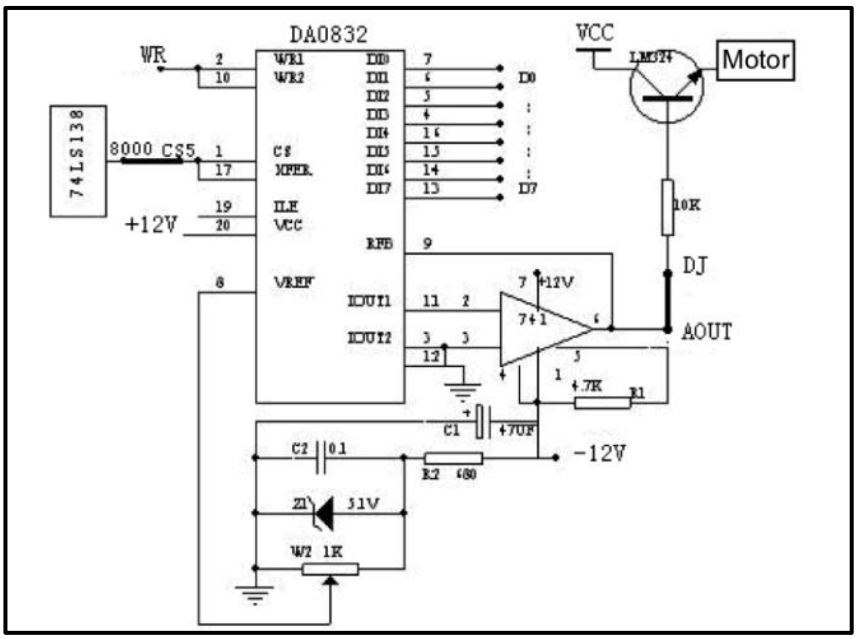
➢ Abstract:

- Master the driving principle of a DC motor.
- Understand the method of DC motor speed regulation.

➢ Introduction:

In this experiment, we will learn about DC motors and how to control their speed using DAC. The DAC receives a code between 0-255 from the microprocessor to control the speed of the DC motor.

The wiring diagram of the DC motor driving circuit on MML8086K3 is shown in the figure below.



➢ Tools:

- MML8086K3.
- MML8086K3 Software: 86PCI Debug Software.
- DAC0832.
- DC motor.

➢ Procedure and Discussion:

Controlling the speed of DV motor by using two push buttons, one for increasing the speed and one for decreasing it.

1. Connoting buttons at port A (input) and DAC at port 0ff80h.
2. The motor is initially turned on at speed 100.
3. Increase and decrease buttons change the value by 10.
4. When outing to DAC, the DAC changes the speed of the motor with values between 0 to 255 (we used increment by 10 so from 0 to 250). The DAC is used to convert digital speed values to analog.
5. If the speed value is max (250) the speed stays the same until there is a decreased action.
6. If the speed value is min (0) the speed stays the same until there is increment action.
7. The code:

```
CODE SEGMENT
ASSUME CS:CODE
ORG 2000H

START:
MOV DX, 0FF2BH      ;Moving the data to register with port number 0FF2Bh.
MOV AL, 90H         ;Making port A input and port B output.
OUT DX, AL          ;Put 90h on port number 0FF2Bh (Control word register).
MOV BL, 0           ; Initialize BL register to 0 to initialize the speed.
MOV AL, BL          ; Move the value of BL (motor speed control value) into AL.
MOV DX, 0FF80H      ; Load DX with the DAC's port address.
OUT DX, AL          ; Output the initial speed control value to the DAC, the speed = 0.

LBL:
CALL DELA           ; Call the delay.
MOV DX, 0FF28H      ; Load DX with the input port A address (where push buttons are connected).
IN AL, DX           ; Read the state of the buttons into AL.
PUSH BX             ; Save BX on the stack to use it temporarily.
MOV BL, AL          ; Move the buttons' state into BL for processing.
OR AL, 7FH          ; Set the MSB of AL to 0, making sure we compare only relevant bits.
CMP AL, 7FH         ; Compare AL to 7FH to check if the increase button is pressed.
JE INCREASE         ; If yes, jump to INCREASE label.

MOV AL, BL          ; Move the original buttons' state back into AL.
OR AL, 0BFH         ; Set bit 6 to 0, leaving other bits unchanged for comparison.
CMP AL, 0BFH        ; Compare AL to 0BFH to check if the decrease button is pressed.
JE DECREASE         ; If yes, jump to DECREASE label.
JMP LBL             ; If no buttons are pressed, jump back to LBL and repeat the loop.
```

```
INCREASE:
POP BX              ; Restore the original BX value.
CMP BL, 250         ; Check if the speed is at the maximum allowed value.
JE LBL              ; If yes, just loop back without increasing speed.
ADD BL, 10          ; Otherwise, increase the speed by 10.
MOV AL, BL          ; Move the new speed value into AL.
MOV DX, 0FF80H      ; DAC's port address.
OUT DX, AL          ; Output the new speed to the DAC.
JMP LBL             ; Jump back to the main loop.

DECREASE:
POP BX              ; Restore the original BX value.
CMP BL, 0           ; Check if the speed is already = 0.
JE LBL              ; If yes, loop back without decreasing speed.
SUB BL, 10          ; Otherwise, decrease the speed by 10.
MOV AL, BL          ; Move the new speed value into AL.
MOV DX, 0FF80H      ; DAC's port address
OUT DX, AL          ; Output the new speed to the DAC.
JMP LBL             ; Jump back to the main loop.

DELA:
PUSH CX             ; Save CX on the stack.
MOV CX, 0FFFH       ; Load CX with a count for a delay.
L1: NOP             ; Just a delay.
LOOP L1             ; Decrease CX by 1 and loop.
POP CX              ; Restore the original value of CX.
RET

END START
CODE ENDS
```

➢ Conclusion:

We conclude from this experiment how to use the DAC to convert digital speed values to analog to control the speed of DC motor.