Microprocessors and Interfacing

Flour Packing Machine

Question No: 9

Batch B73

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Submitted To:

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An assignment submitted in partial fulfillment of the course requirements for

Microprocessor Programming and Interfacing

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Problem Statement:

Design a Micro Processor based flour packing machine. You have flour contained in the silo. The user keys in the required amount of flour per packet. The system should take the input and pack the specified amount of flour upon press of a START key. It is also required to monitor the temperature of the floor where packing is going on. This temperature range can be user settable and also should be displayed. Display the number of packets packed in every hour. An alarm for any malfunctioning of the system should be provided.

Design Specifications

Temperature Sensor

Calibrated in degree Celsius

Linear + 10mV/degree Celsius scale factor

Operating voltage: 4-20 Volt

Output range: 2 – 150 degree Celsius

Accuracy: +- 0.2 degree Celsius

Weight Sensor

Calibrated in pounds

Linear 10mV/ pound scale factor

Output Range: 0-500 pounds

Assumptions:

- User inputs the temperature in ° C
- Four temperature sensors (LM 35) are sufficient to monitor the packaging area
- Minimum temperature entered is 2°C
- Maximum temperature entered is 99°C
- Minimum temperature range is less than maximum temperature range
- Weigh per packet is entered in lbs and is less than 99lbs.
- All user inputs should be whole numbers.

SYSTEM DESIGN

When the system is turned on the user is expected to select a mode tempSetLower/ tempSetUpper/weightSet/Start on pressing the respective key.

If start is pressed the default values are loaded and the system starts packing. A valid input is expected from the user on selecting any of the above modes other than Start.

On pressing the start key the temperature values entered by the user are displayed. The system checks if the average temperature is within the range specified by the user. If it isn't the flour flow is stopped and alarm is raised. The user has to acknowledge this alarm by press of any key. After acknowledge the system restarts. The weight of the flour packed is also constantly checked. If this is greater than or equal to the specified value the conveyer motor moves forward and flour is packed into the new packet. The number of packets packed is displayed after every hour.

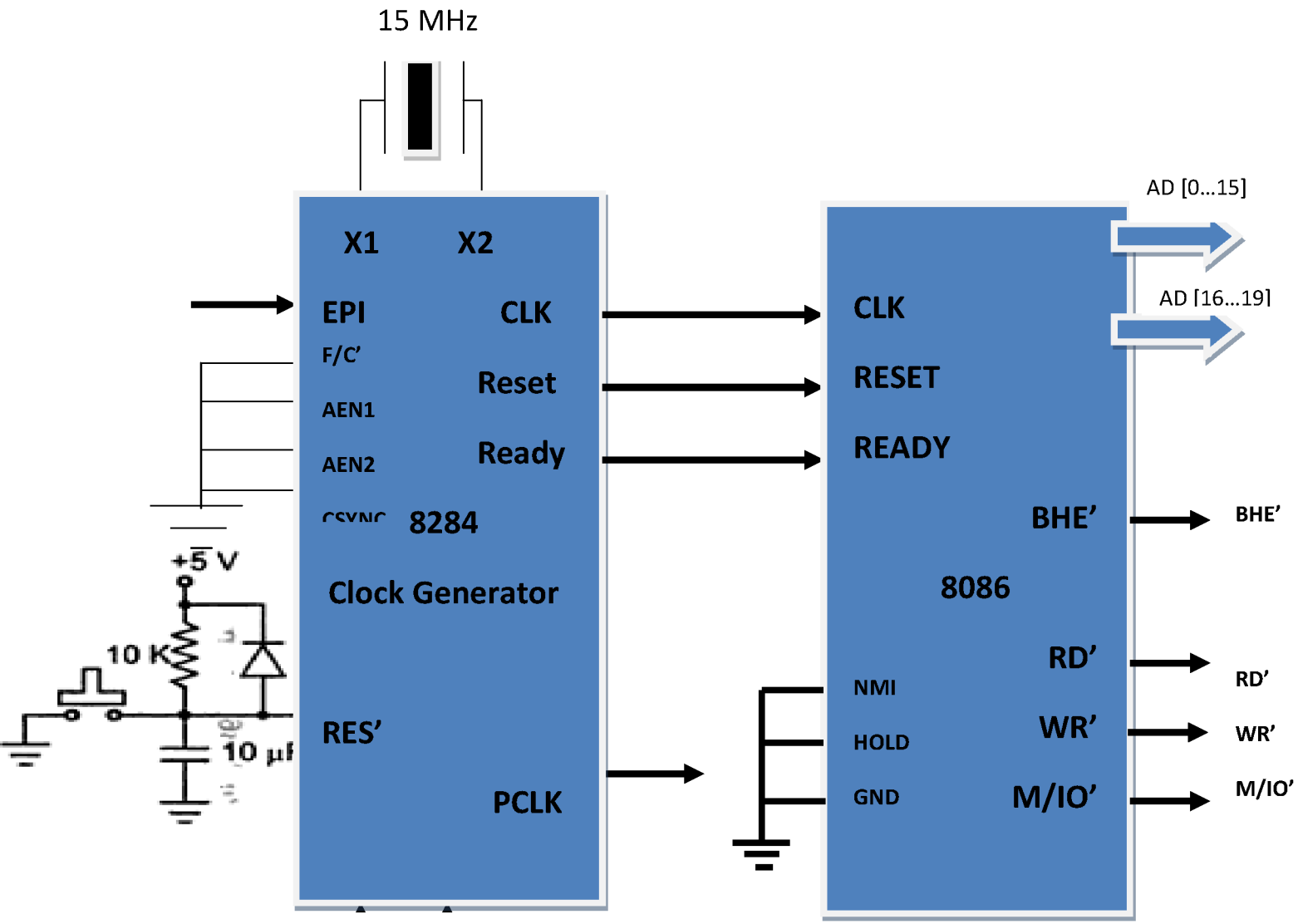
While setting the temperature or weight the user is expected to enter the tens place value and then the units place value respectively.

Components Used

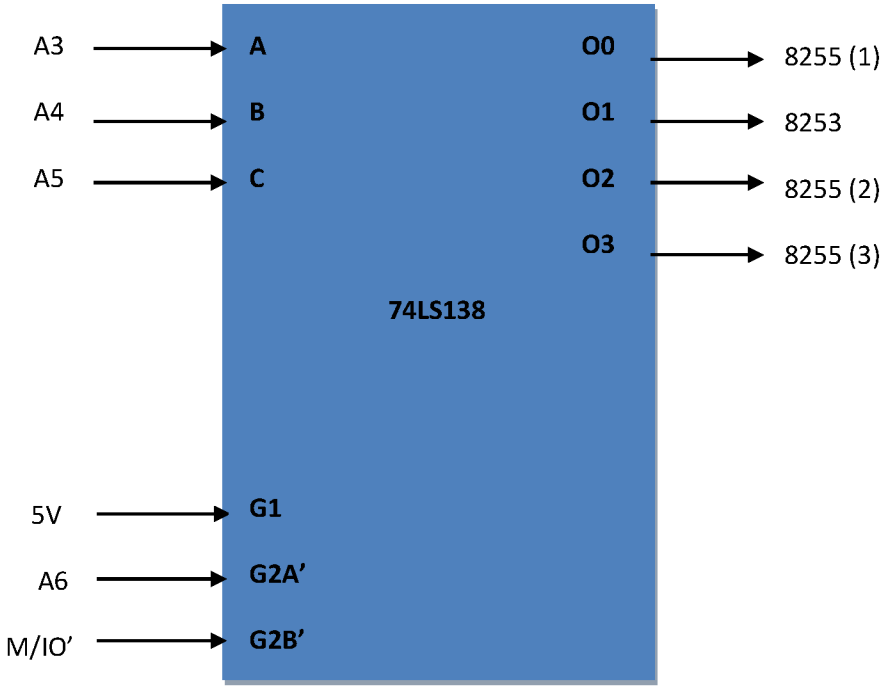
Sr. No.	Components Used	Quantity	Purpose
1.	8086	1	Central Processor
2.	8255	3	PPI for I/O
3.	8253	1	Programmable interval timer
4.	6116 RAM	1	RAM for the Memory
5.	2732 ROM	1	EPROM
6.	74LS138	1	Address Decoder
7.	74LS373	11	Latching the Bus
8.	74LS245	2	Bi-Directional Buffer
9.	L293D	1	Motor Driver
10.	ADC0808	1	ADC 8 channel 8 bit
11.	7447	7	BCD to Seven segment Display
12.	Load Cell	1	Weight sensor
13.	LM35	4	Temperature sensor
14.	OR Gate	6	
15.	Keypad	1	16 Key Matrix
16.	7-Segment common anode Display	6	O/p Display
17.	7-Segment common anode Multiplexed	1	O/p Display
18.	LED	3	Output Status

Hardware Design

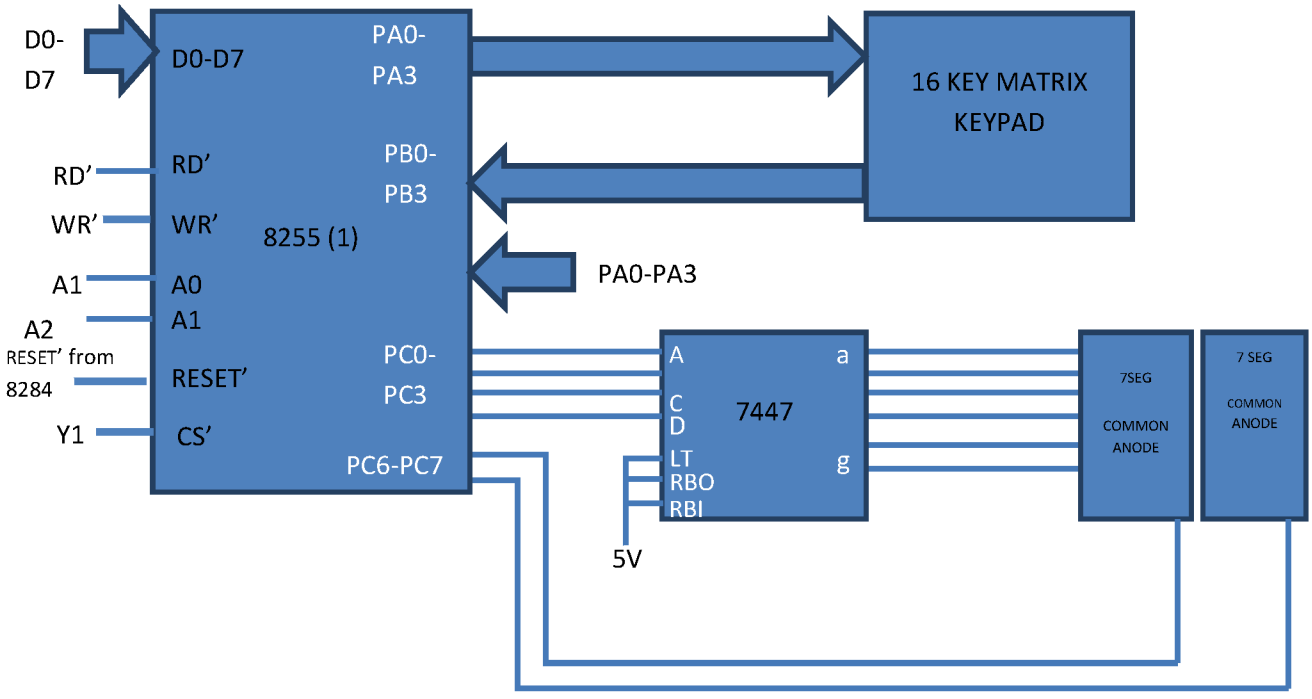
CLOCK GENERATOR



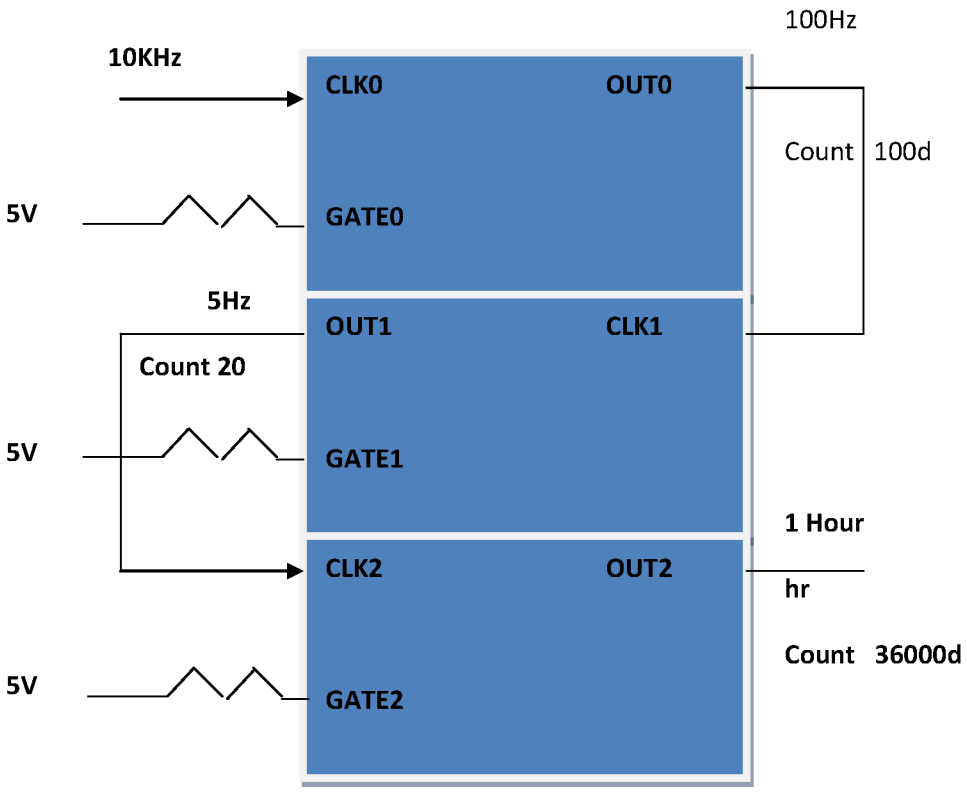
I/O DECODING



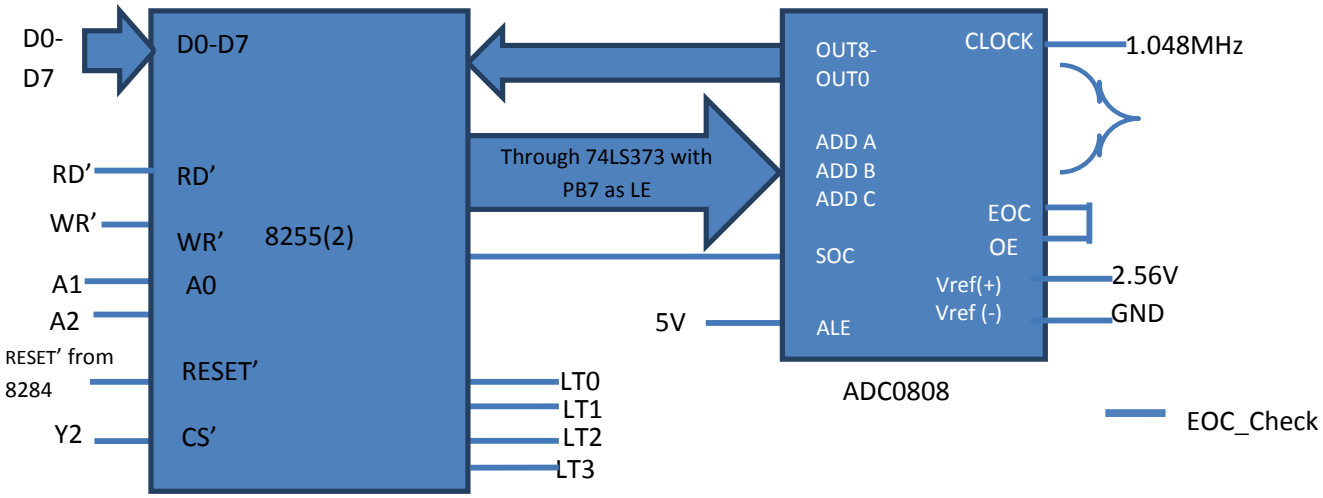
KEYPAD INTERFACING



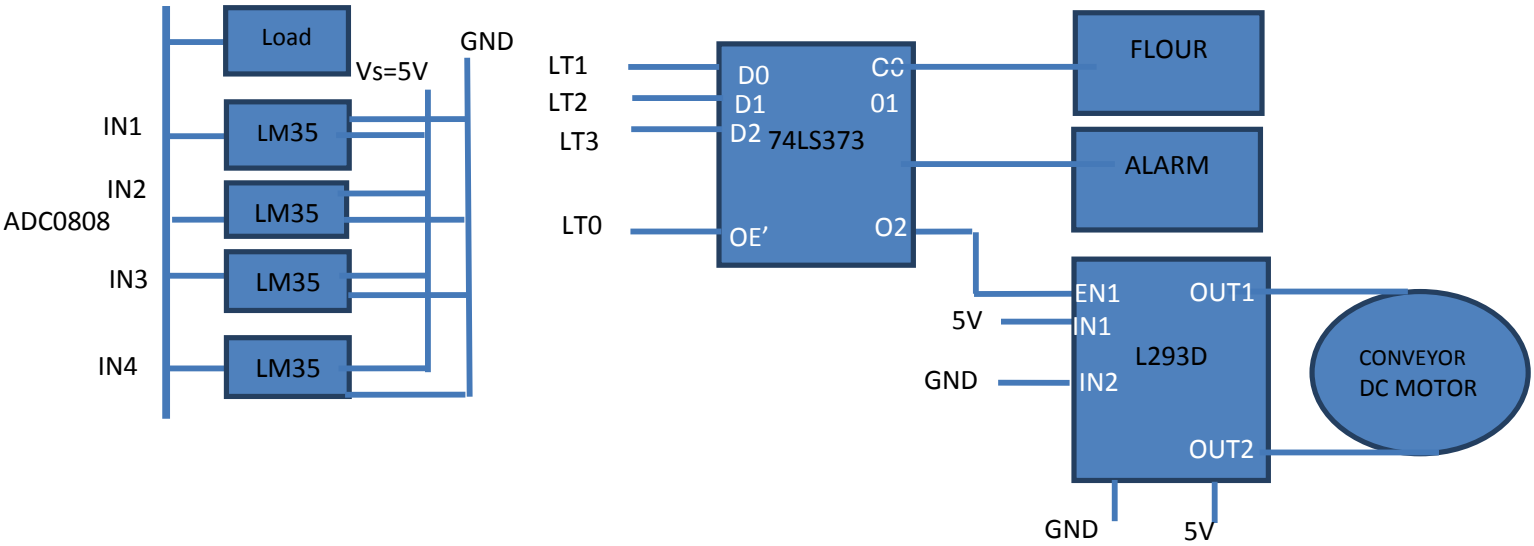
TIMER


100Hz
10KHz
CLK0
OUT0
Count
100d
5V
GATE0
5Hz
OUT1
CLK1
Count 20
5V
GATE1
1 Hour
CLK2
OUT2
hr
Count
36000d
5V
GATE2

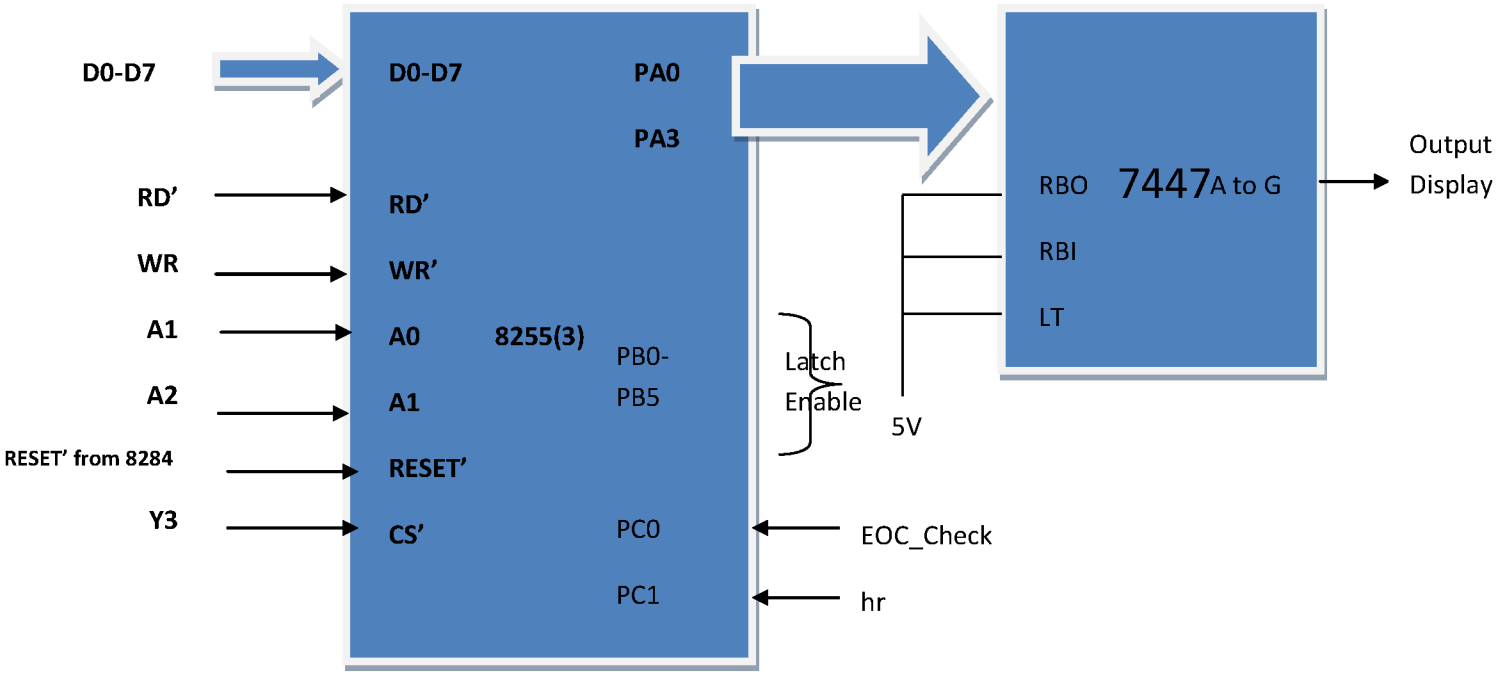
ADC INTERFACING



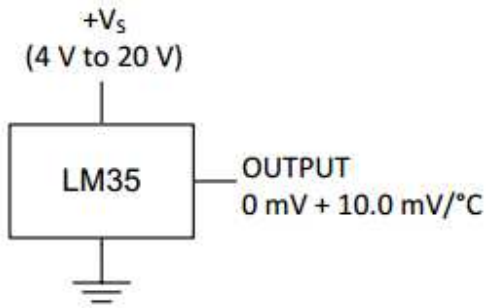
TEMPERATURE SENSOR AND MOTOR INTERFACING



DISPLAY INTERFACING

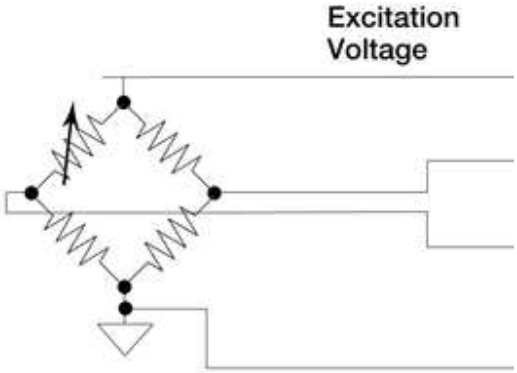


Actuator interfacing



Temperature sensor

ADC 0808



Load cell

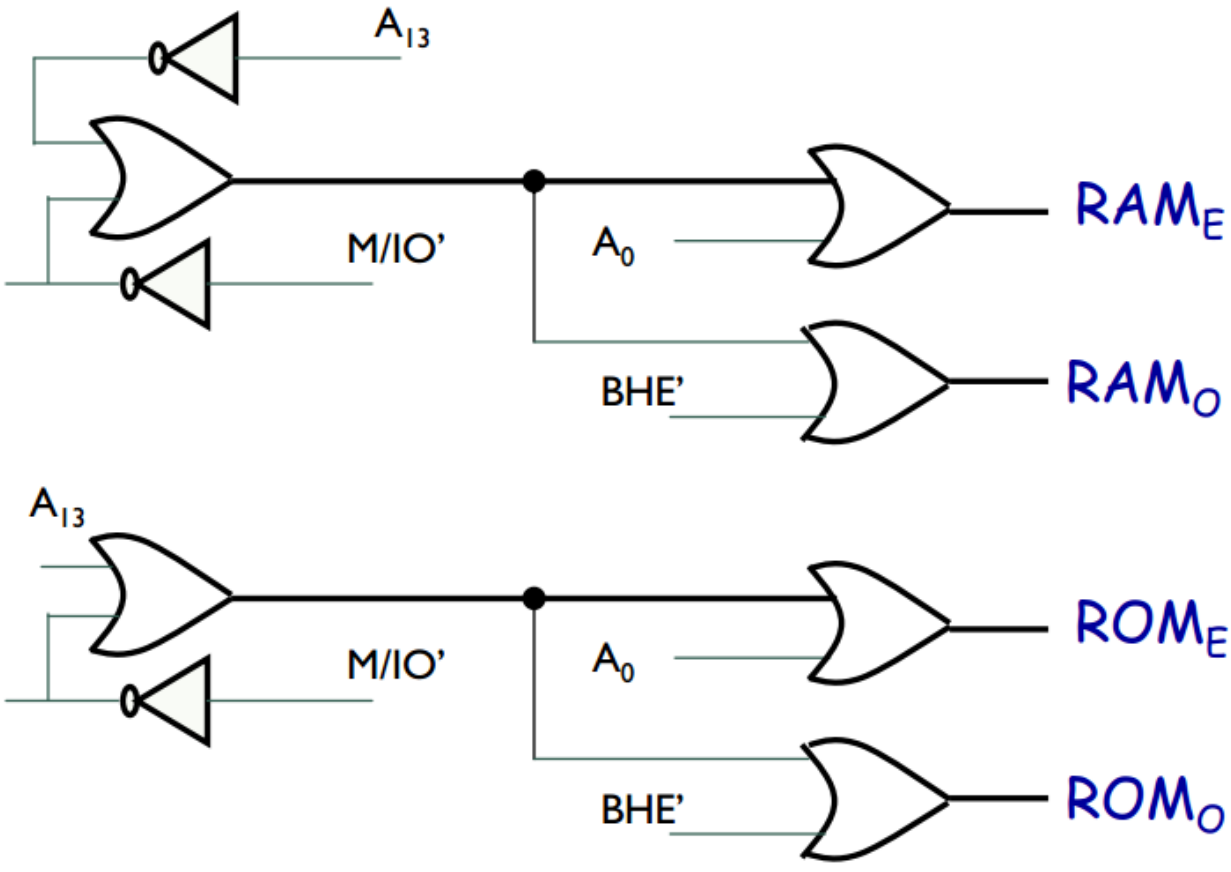
MEMORY INTERFACING

RAM (min 2k chip) : 4k

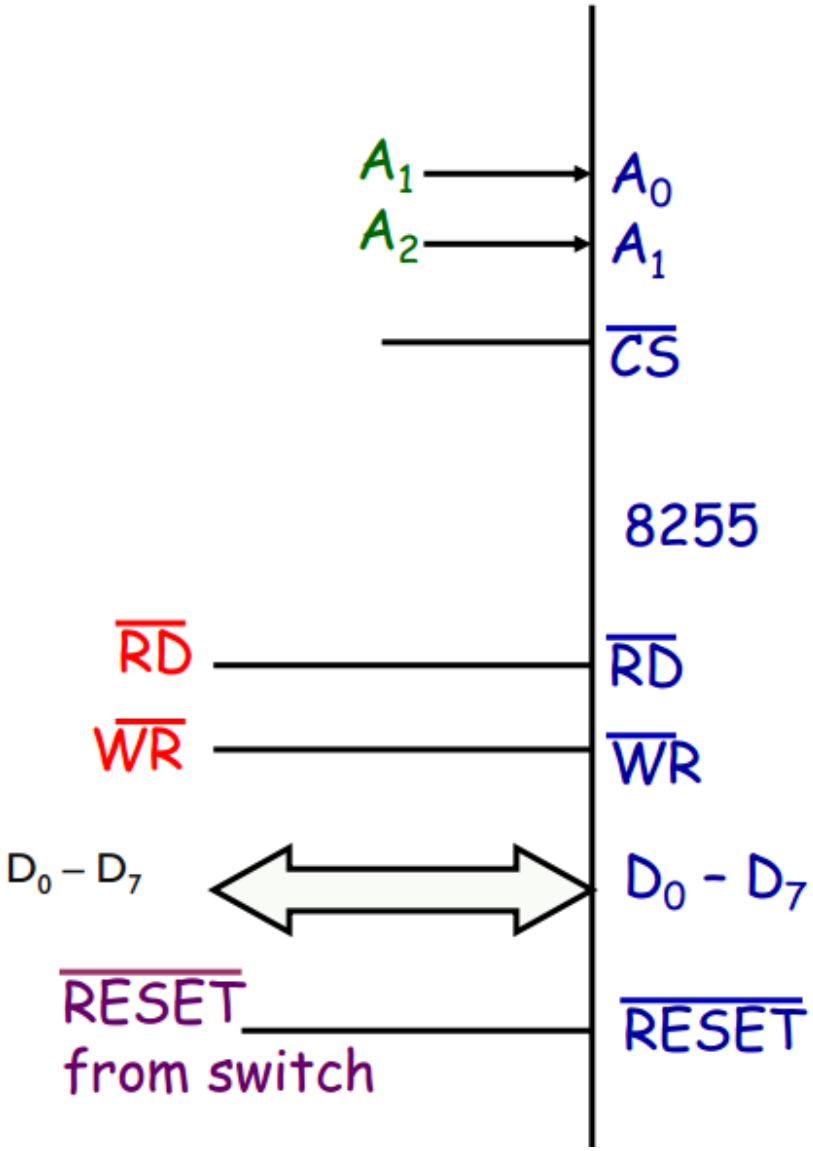
ROM (min 4k chip) : 8k

ROM1 : 00000h -01FFFh

RAM1 :02000h-02FFFh

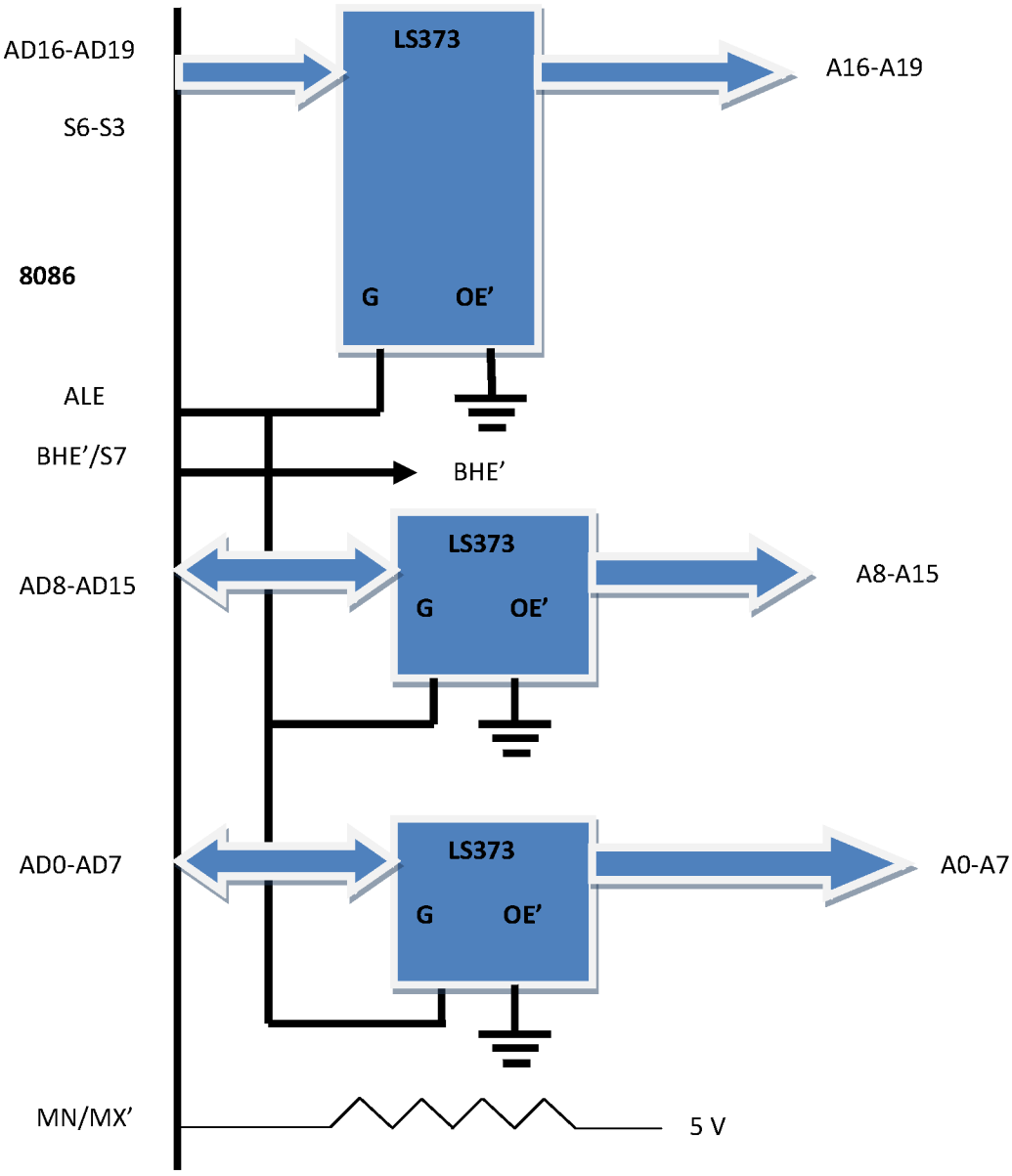


8255


A1
A2
A0
A1
CS
8255
RD
WR
RD
WR
D0 – D7
D0 - D7
RESET
from switch
RESET

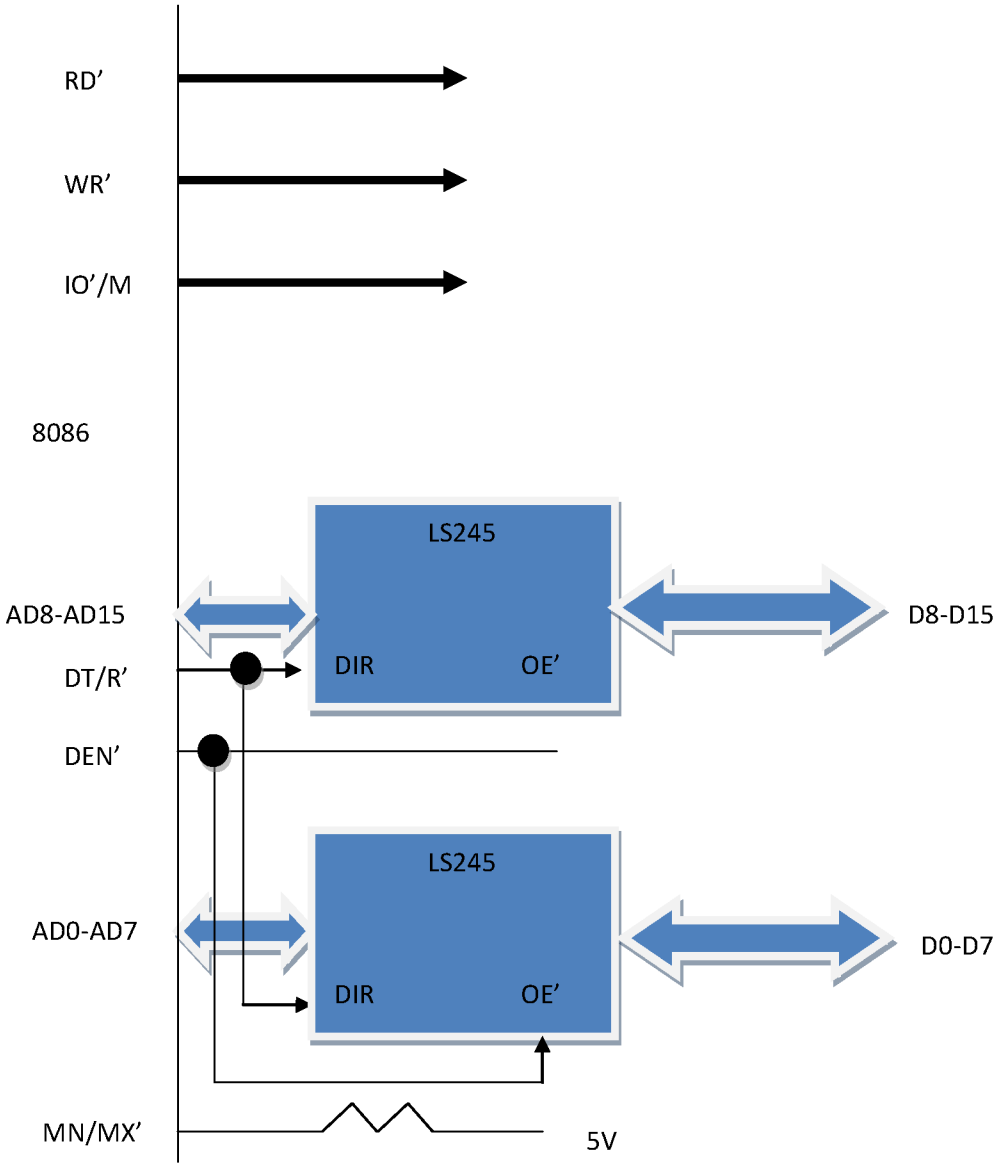
SYSTEM BUS OF 8086

Address

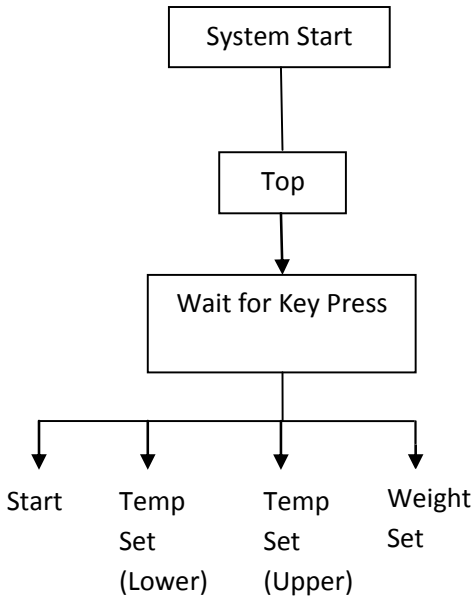


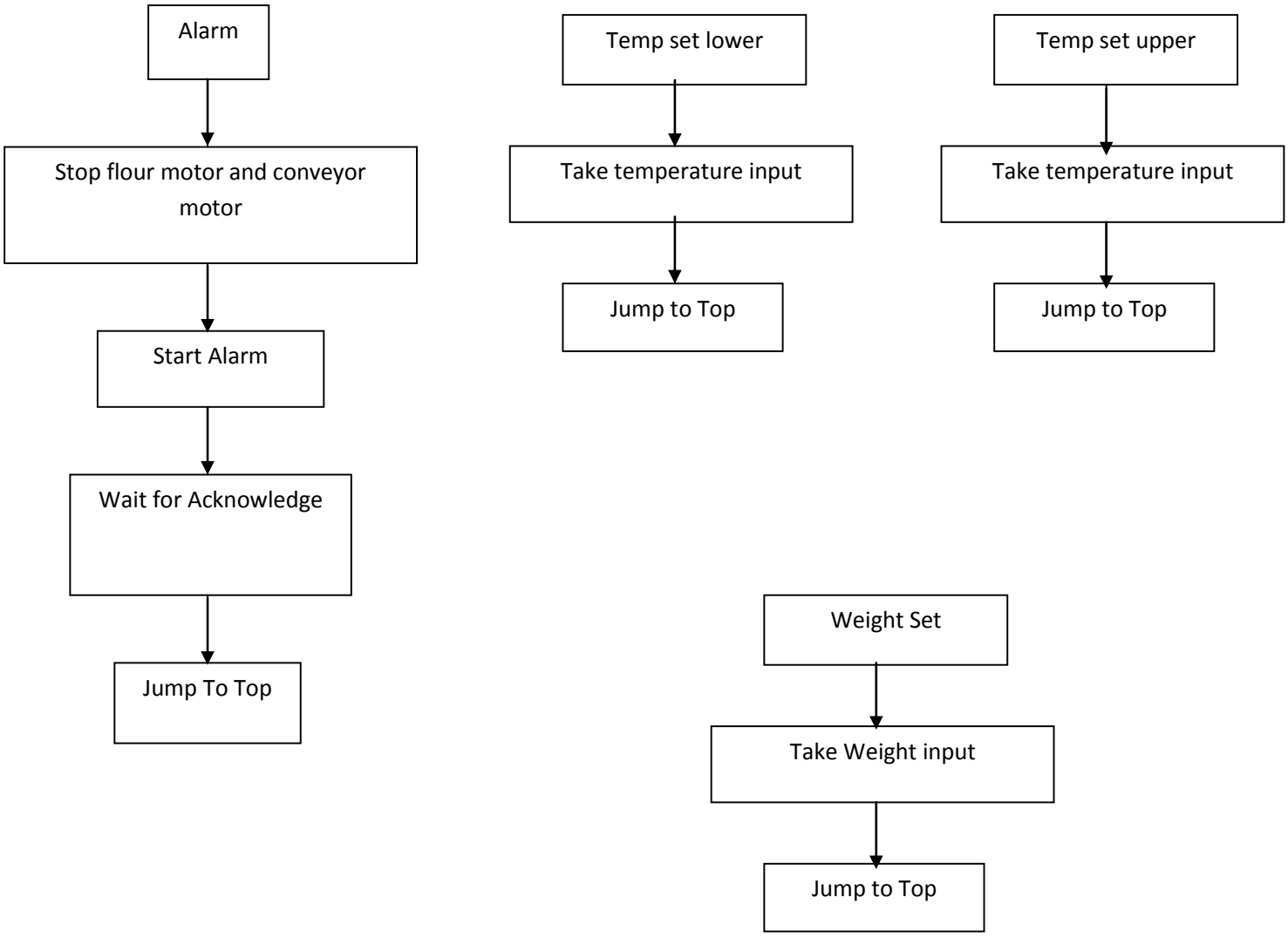
SYSTEM BUS 8086

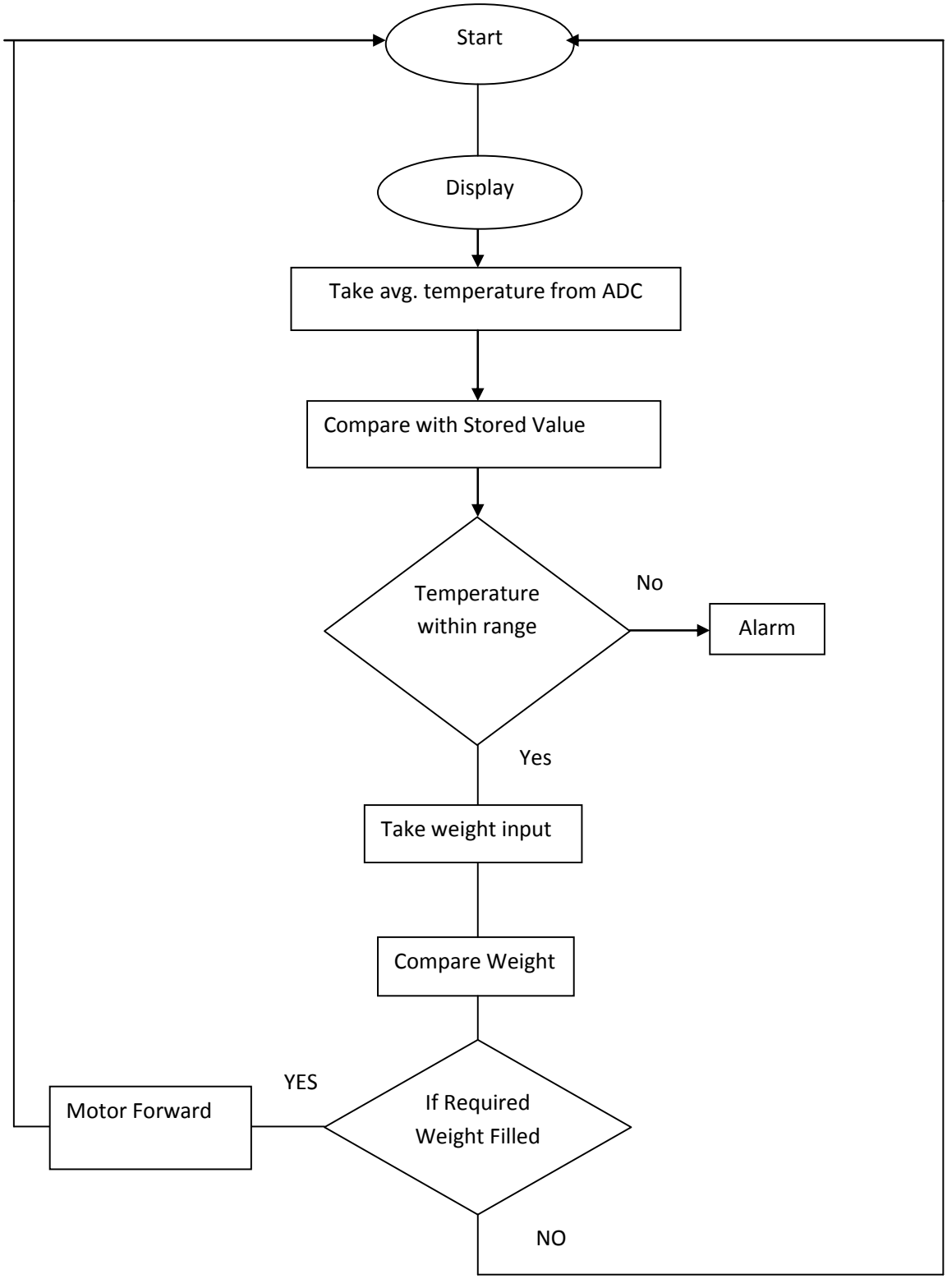
Data control

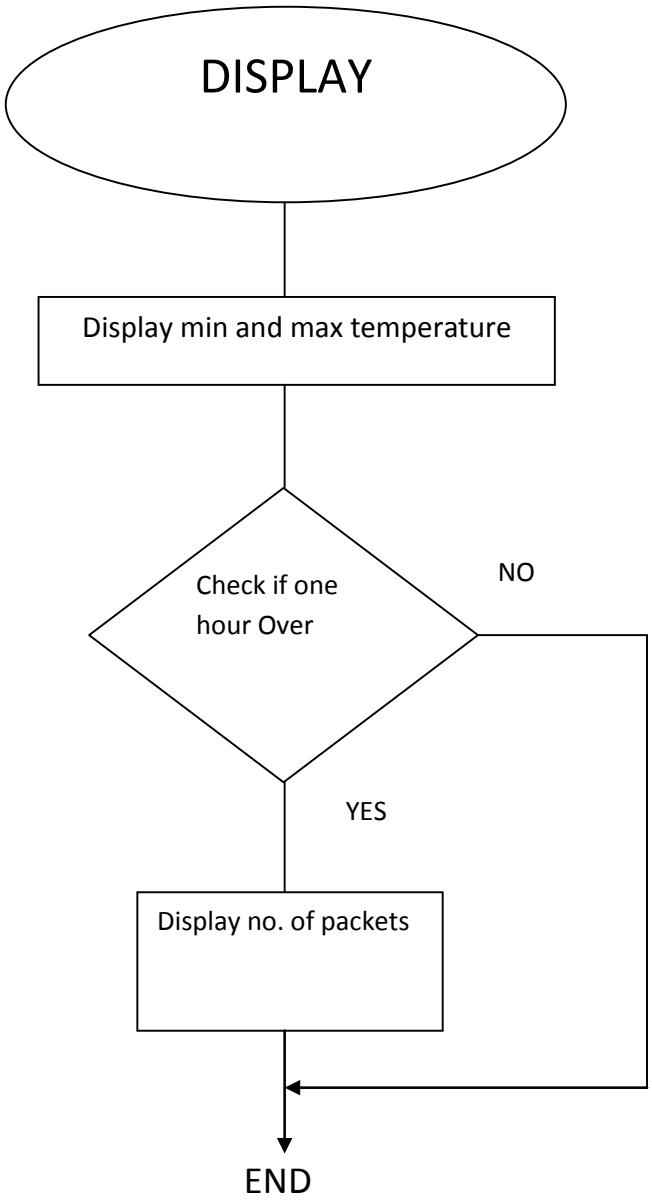


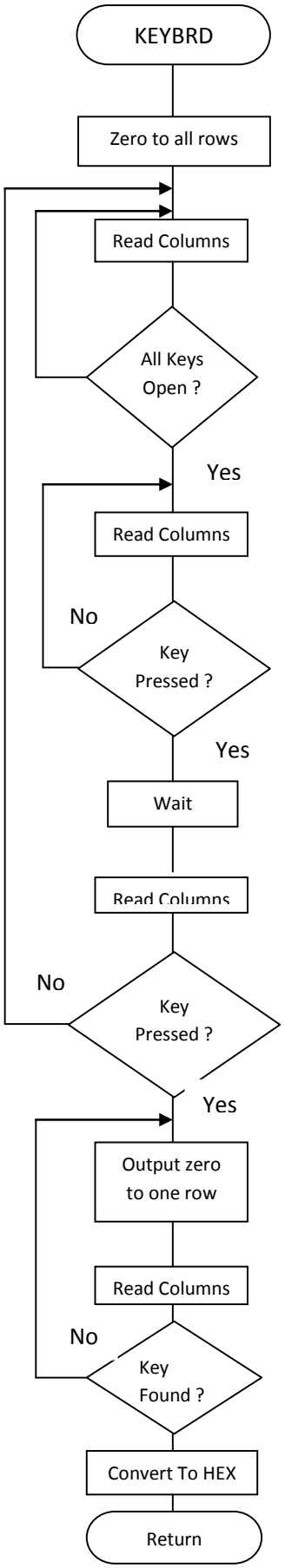
Flow Charts


System Start
Top
Wait for Key Press
Start
Temp Set (Lower)
Temp Set (Upper)
Weight Set


Alarm
Stop flour motor and conveyor motor
Start Alarm
Wait for Acknowledge
Jump To Top
Temp set lower
Take temperature input
Jump to Top
Temp set upper
Take temperature input
Jump to Top
Weight Set
Take Weight input
Jump to Top


Start
Display
Take avg. temperature from ADC
Compare with Stored Value
Temperature within range
No
Alarm
Yes
Take weight input
Compare Weight
If Required Weight Filled
YES
Motor Forward
NO


DISPLAY
Display min and max temperature
Check if one hour Over
NO
YES
Display no. of packets
END


KEYBRD
Zero to all rows
Read Columns
All Keys
Open ?
Yes
Read Columns
No
Key
Pressed ?
Yes
Wait
Read Columns
No
Key
Pressed ?
Yes
Output zero
to one row
Read Columns
No
Key
Found ?
Convert To HEX
Return

APPENDIX

The appendix contains the list of all datasheets of all the chips used.

8086
http://www.datasheet-pdf.com/datasheetdownload.php?id=544568

8255
http://www.alldatasheet.com/datasheet-pdf/pdf/66100/INTEL/8255A.html

8259
http://www.alldatasheet.com/datasheet-pdf/pdf/66107/INTEL/8259A.html

8253
http://www.alldatasheet.com/datasheet-pdf/pdf/66098/INTEL/8253.html

ADC0808
http://html.alldatasheet.com/html-pdf/8097/NSC/ADC0808/38/1/ADC0808.html

Load Cell

http://www.velamed.com/englisch/products/electromyography/noraxon-sensors/noraxon-sensors.html

LS138

http://www.alldatasheet.com/datasheet-pdf/pdf/46206/SLS/LS138.html

74373

http://www.alldatasheet.com/datasheet-pdf/pdf/192081/TI/LS373.html

74245

http://www.alldatasheet.com/datasheet-pdf/pdf/44472/SIEMENS/BF245.html

L293D

http://www.ti.com/lit/ds/symlink/l293d.pdf

LM 35

http://www.ti.com/lit/ds/symlink/lm35.pdf