EEE F241 : Microprocessor Programming and Interfacing

DESIGN ASSIGNMENT:

PROJECT – 23

INTELLIGENT HUMIDISTAT

By

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Contents

PROBLEM STATEMENT

DESCRIPTION : A humidistat is supposed to be reset according to the outside temperature - as the outside temperature falls, the humidity level inside the house should be set lower. The purpose of this project is to develop a humidistat which senses the outside temperature and adjusts the humidity accordingly. Two sensors are required: outside temperature and inside humidity. Output is provided via a simple relay with the humidifier (presumably on the furnace) being on or off. Also readings from the humidity and temperature sensors must be displayed on an LCD display. The entire system can be turned on or off using a single switch.

SPECIFICATIONS : One Humidity sensor placed inside the room to measure relative humidity of the room. One temperature sensor to measure the temperature outside the room. One humidifier inside the room to increase the humidity of the room and one de-humidifier inside the room to decrease the humidity of the room.

ASSUMPTIONS

The following are the assumptions made regarding the system:

- The outside temperature is between 0 ℃ and 99 ℃.
- We are using potentiometer to stimulate the sensor assuming they can be replaced by sensors giving analog output calibrated with the ADC. Because the voltage output of temperature and humidity sensor were varying linearly with their irrespective humidity and temperature, so we used potentiometer instead.
- We are assuming that at the lowest temperature (0 ℃) relative humidity is 0% and at the highest temperature (99 ℃) relative humidity is 99%.. This can be calibrated according to the needs.

LIST OF COMPONENTS USED

Hardware Device	Quantity	Description	Purpose
8086	1	Microprocessor	Central Processing Unit
6116	2	SRAM	Used to store the temporary data (like temperature values, stack, etc.) Size – 16k (2K * 8)
2732	2	EPROM	Erasable Programmable Read Only Memory; in which the code resides. Size – 32k (4k * 8)
LM016L	1	16 * 2 LCD Display	To display temperature and relative humidity
8255	2	Programmable Peripheral Interface	Provides I/O ports for the other devices
ADC0808	1	Analog to Digital Converter	Converts the analog voltage to its digital equivalent
74LS245	2	8 bit bidirectional buffer	Buffering Data bus
74LS138	1	8 bit unidirectional buffer	Buffering the Control Lines
74LS373	3	8 bit octal latches	Latching the address bus
2N7000	3	Mosfet	Switching relay on and off
	6	OR Gates	For building decoding logic for memory interfacing and I/O interfacing.
	3	NOT Gates	To power on high voltage devices.
	1	Single pole throw switch	Main power switch

	1	1 MHz Clock	
	2	10k Resistors	
	1	Blue LED	To represent Humidifier
	1	Green LED	To represent De-Hudifier

Memory Mapping

Size of 2732 (ROM) : 4k

ROM (even) : 00000h - 01FFEh (A0 = 0)

ROM (odd) : 00001h - 01FFFh (A0 = 1)

A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0
0	0	0	X	X	X	X	X	X	X	X	X	X	X	X	X

Size of 6116 (RAM) : 2k

RAM(even) : 02000h - 02FFEh (A0 = 0)

RAM(odd) : 02001h - 02FFFh (A0 = 1)

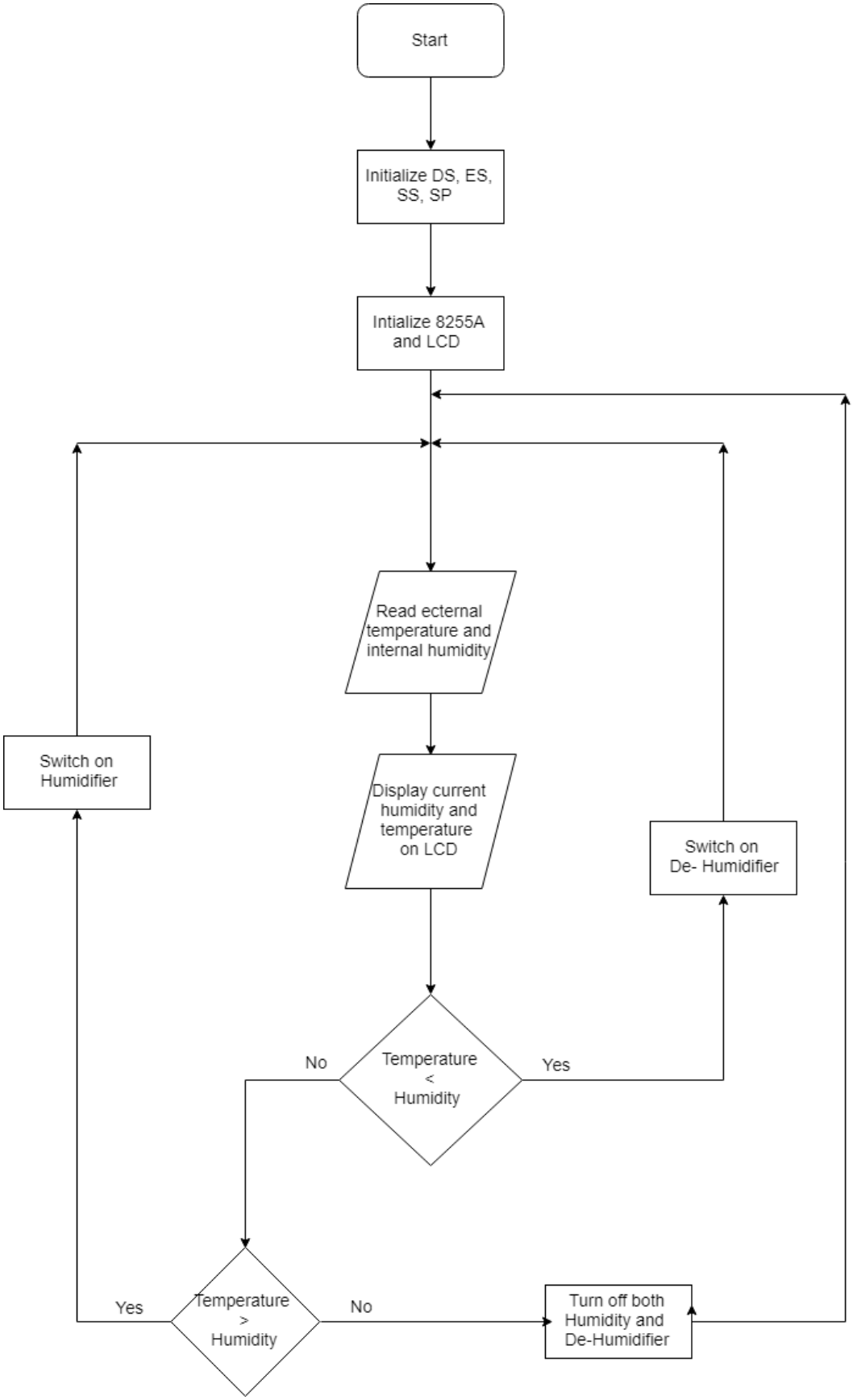
A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0
0	**0**	**1**	**0**	X	X	X	X	X	X	X	X	X	X	X	X

I/O Mapping

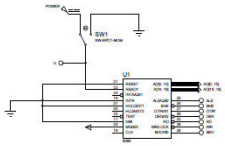
Address of 8255-1 port-A	: 0000h
Address of 8255-1 port-B	: 0002h
Address of 8255-1 port-C	: 0004h
Address of 8255-1 control register	: 0006h
Control word of 8255-1	: 89h
Address of 8255-2 port-A	: 0008h
Address of 8255-2 port-B	: 000Ah
Address of 8255-2 port-C	: 000Ch
Address of 8255-2 control register	: 000Eh
Control word of 8255-2	: 89h

(Will be changed in the ALP accordingly)

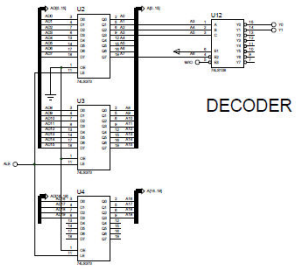
Flow-Chart of the System



Circuit Design

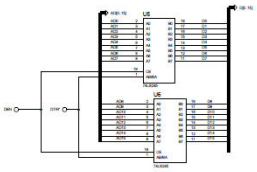


8086 MICROPROCESSOR

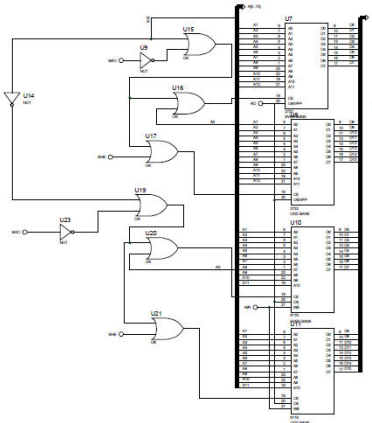


DECODER

ADDRESS LATCHES



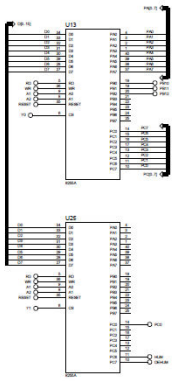
DATA BUFFERS



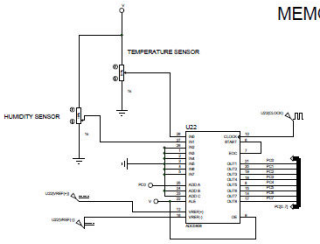
EPROM

SRAM

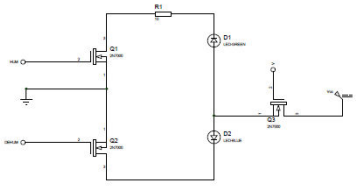
MEMORY



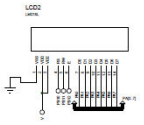
PROGRAMMABLE PRIPHERAL INTERFACE



SENSORS AND ANALOG-TO-DIGITAL CONVERTOR



ACTUATORS



OUTPUT DEVICE (LCD)