

Measuring Temperature of Microcomputer Interface Using 8086 Microprocessors with Design and Simulation

Md Tariqul Islam¹, Akash Joarder², Niaz Ahmed³

Student of Mechanical Engineering, China University of Mining and Technology, Xuzhou, China¹

Student of Mechanical Engineering, China University of Mining and Technology, Xuzhou, China²

Student of Mechanical Engineering, Changsha University of Science and Technology, Changsha, China³

Abstract: Temperature measurement is important in industry because most of the processes are temperature sensitive. Temperature measuring has been done with a number of equipment and techniques over the years. In this paper we analysis major device and design full system input to output to measure temperature perfectly. Mainly, we Drew a flowchart of the system and developed the assembly program in Proteus that was the essential step for hitting the goal. The temperature control system required using 8086 microprocessors to interface a successive approximation ADC with a standard method of measuring and managing temperature.

Keywords: Microprocessor; Circuits; Temperature; Thermistor;

I. INTRODUCTION

One way to measure temperature is to use a thermal resistor. It has a significant value of the thermal coefficient, i.e., changing resistance with changing temperature (at a level of 2-10% per Kelvin). There are two types of thermistors- positive temperature coefficients (PTC), which increase their resistance when temperature is growing up; and Negative Temperature Coefficient (NTC) decreases resistance when the temperature is growing. This article describes the usage of an NTC only in link with an AVR MCU for temperature measurement purposes.

II. TASK ANALYSIS

The Intel 8086 Microprocessor is an enhanced version of the Intel 8085 Microprocessor, that was launched in 1976. It's a 16-bit microprocessor with 20 address lines and 16 data lines, but it can store up to 1MB. It has a large instruction set which allows to do operations like multiplication and division quickly. It seems to have two modes of operation, which are Maximum mode and Minimum mode. The maximum mode is appropriate for a system with many processors, whereas the minimum mode is suitable for a single processor system. The following are the most notable characteristics of an 8086 microprocessor: It features an instruction queue that can keep six instruction bytes from memory, allowing it to process data faster. The first 16-bit processor had a 16-bit ALU, 16-bit registers, and a 16-bit internal data bus.

8086 \rightarrow 5MHz, 8086-2 \rightarrow 8MHz, 8086-1 \rightarrow 10 MHz. It consists of 29,000 transistors:

8255A

The 8255A is a general-purpose programmable I/O device designed to transfer the data from I/O to interrupt I/O under certain conditions as required. It can be used with almost any Microprocessor. It consists of three 8-bit bidirectional I/O ports (24 I/O lines), configured as per the requirement.

74154

Chip 74154 converts a 4-bit binary code to a low signal at one of 16 outputs.

74273

The 74273 microcircuits is used to store eight bits of information simultaneously.

ADC0808

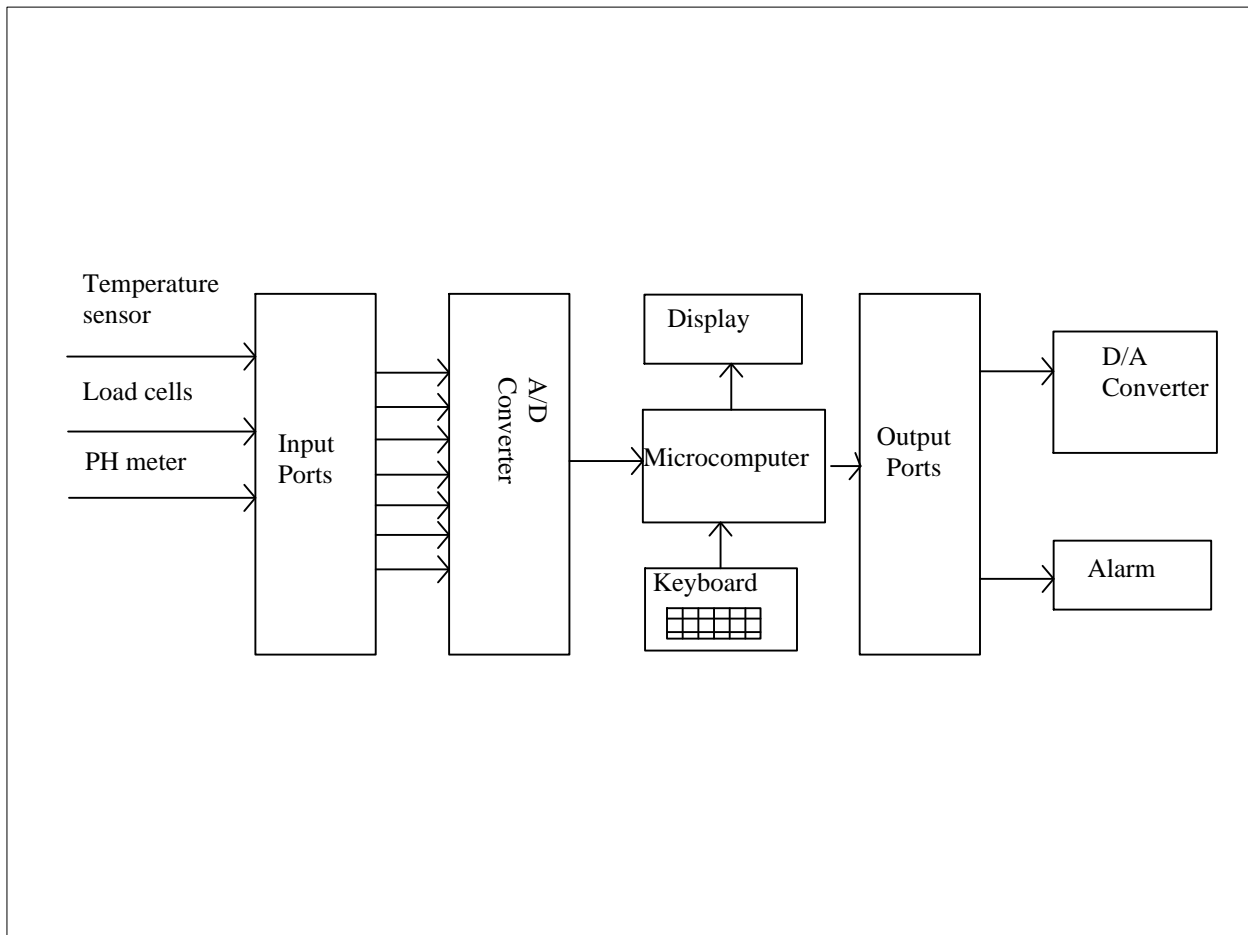
The ADC0808, ADC0809 data acquisition component is a monolithic CMOS device with an 8-bit analogue-to-digital converter, 8-channel multiplexer and Microprocessor compatible control logic.

III. SOLUTION DESIGN

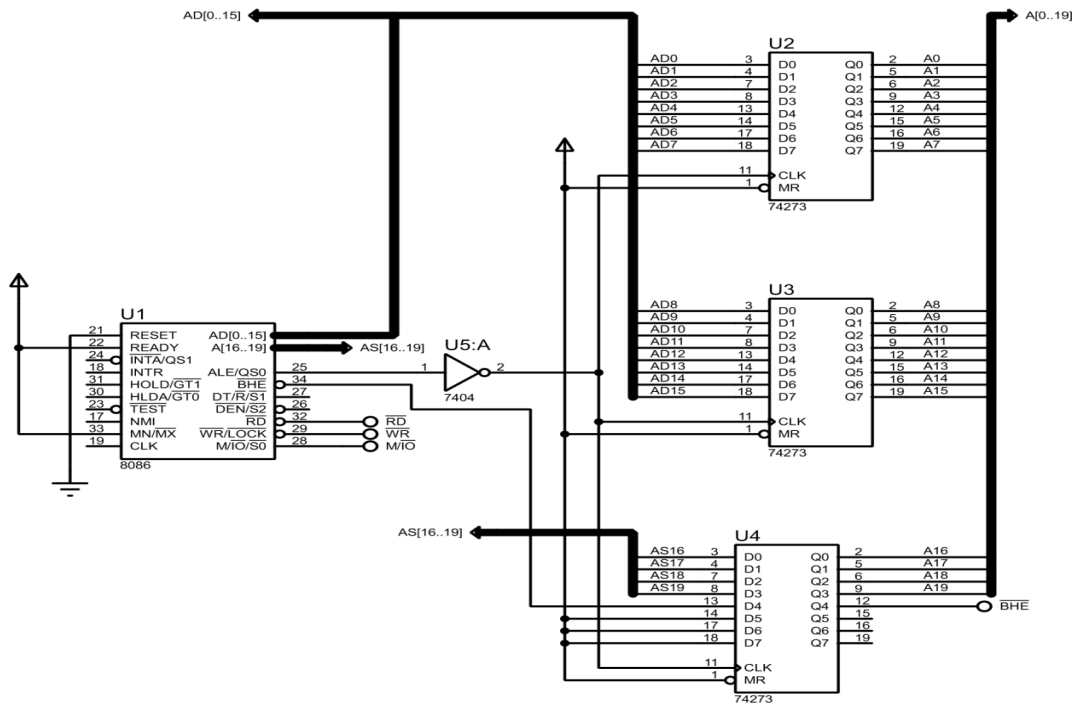
Table: Major Devices

Device	Library	Description
7472	74STD	JK Flip-flop with triple ANDED J and K inputs
7404	74STD	Hex Inverters
8086	MICRO	8086 microprocessors
8255A	MICRO	Programmable peripheral interface with 24 I/O lines
74157	74STD	4-to-16 Line decoder/DE multiplexer
74273	74STD	Octal D-type positive-edge-triggered flip-flop with clear
ADC0808	ANALOG	8-bit Microprocessor compatible ADC with 8 channel multiplexers
DIODE-ZEN	DEVICE	Generic Zener diode
LM741	NATOA	Operational amplifier
NPN	DEVICE	Generic NPN bipolar transistor
NTC	TRXD	Generic Model for negative temperature coefficient resistor
POT-HG	ACTIVE	High Granularity Interactive Potentiometer

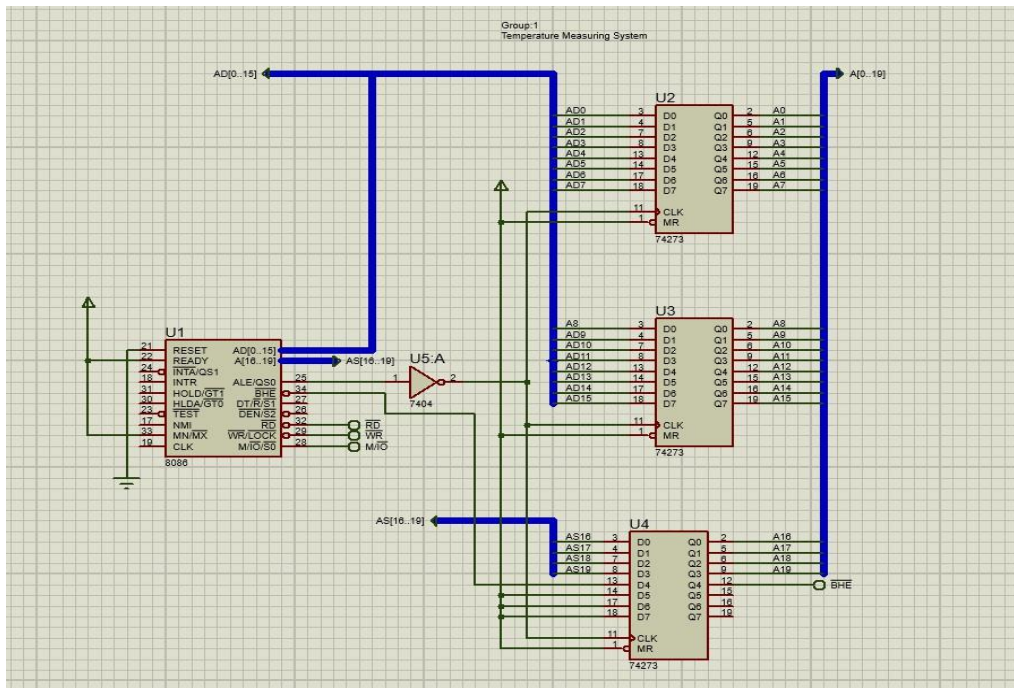
Flow chart of the design



8086 Minimum System (Temperature Measuring System)



Using on Proteus-8 (Temperature Measuring System)

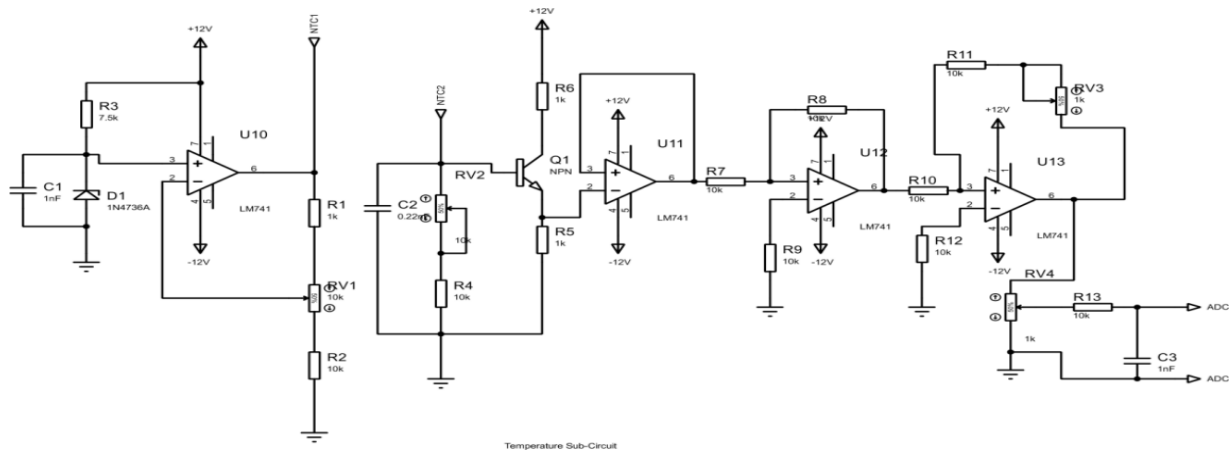


IO device

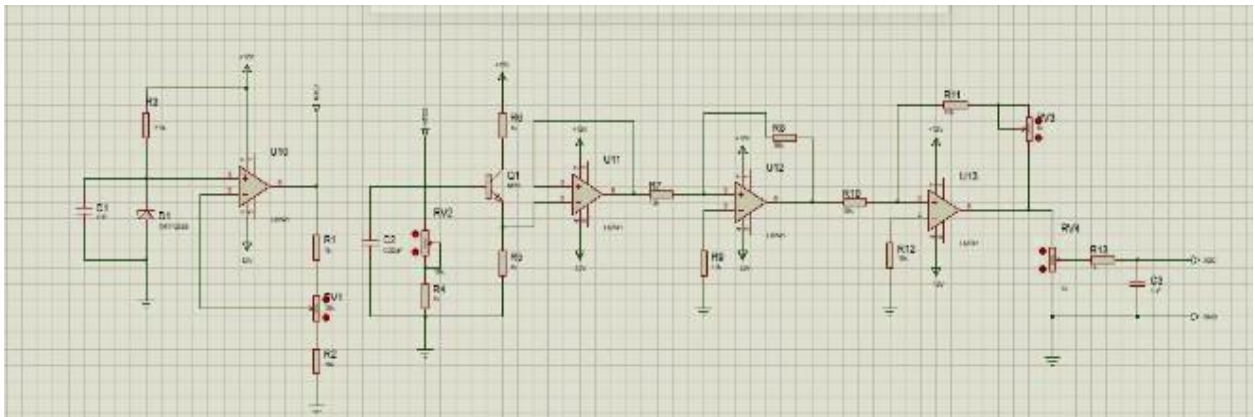
An input/output (I/O) device is a device that can take, process, and output data. It can also receive media data as input and send it to a computer, as well as send computer data to storage media as a storage output.

Sub circuits are self-contained

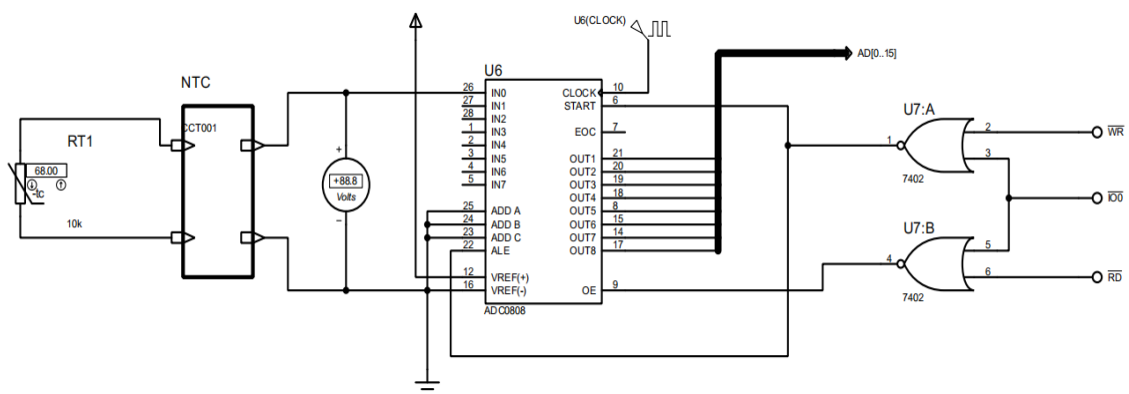
Circuits that appear as "black boxes" in other circuits. A given sub circuit may be used any number of times at multiple levels just as long as it does not become a sub circuit of itself.



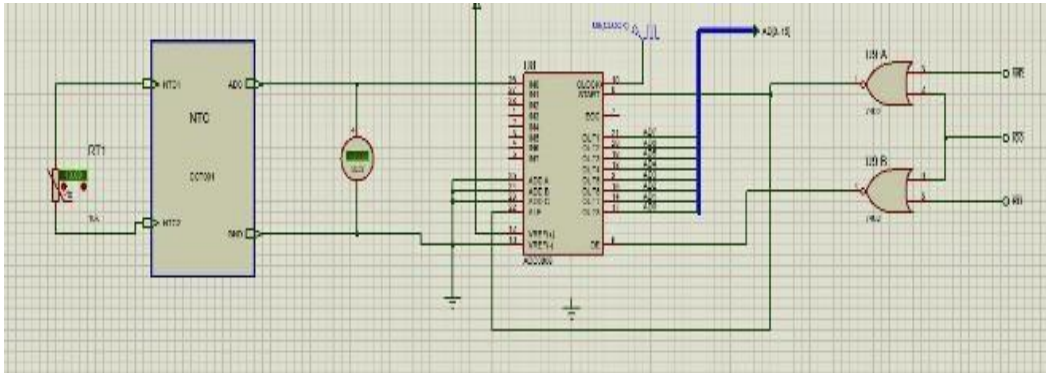
Using on Proteuce-8 (Temperature Sub circuits)



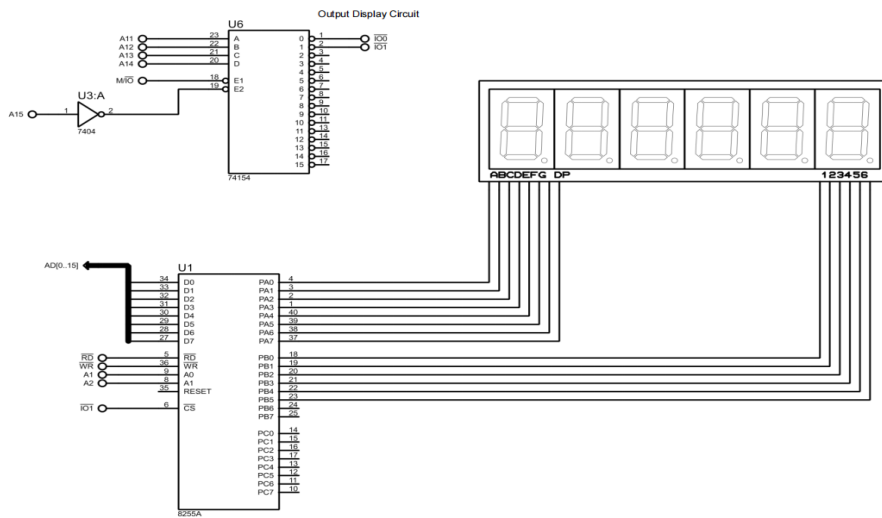
Input circuit



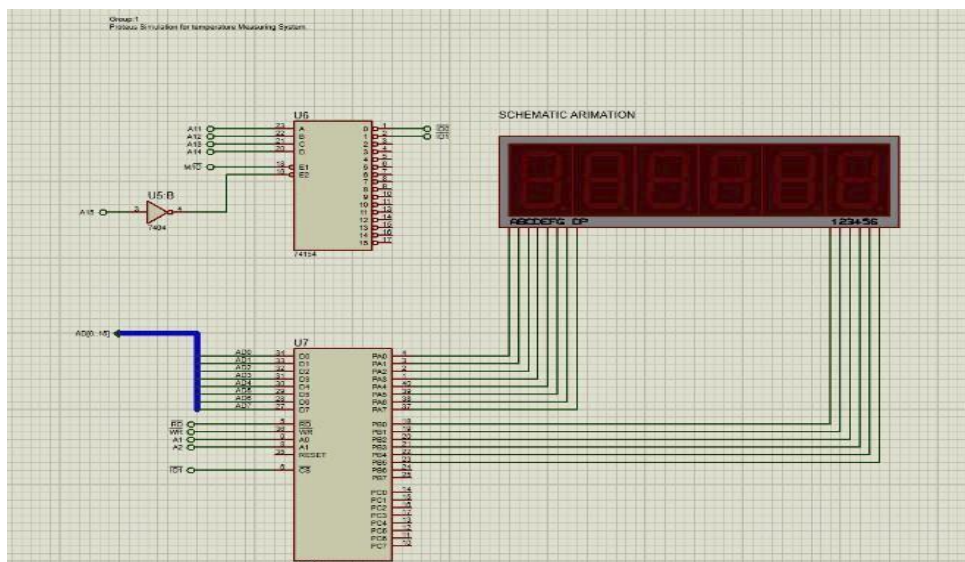
Using Proteuce-8 (Input circuit)



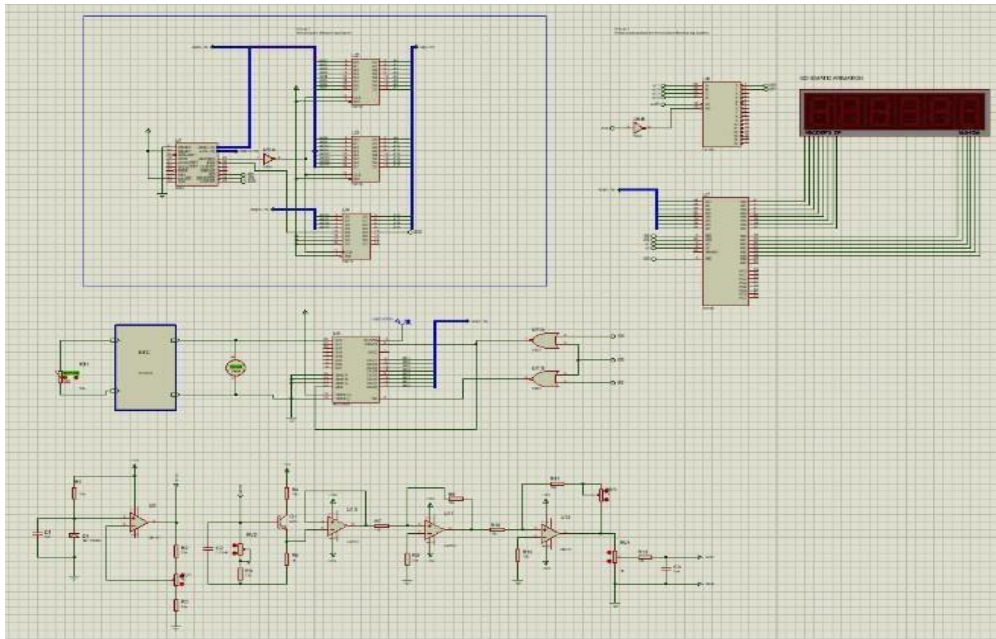
Output circuit



Output circuit on Proteuce

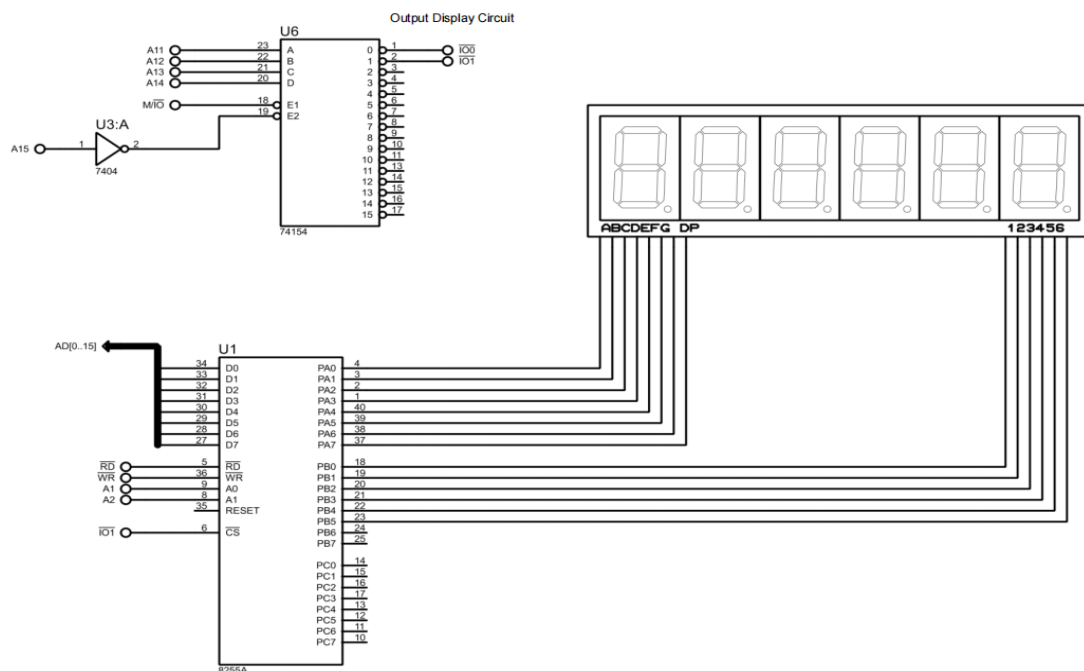


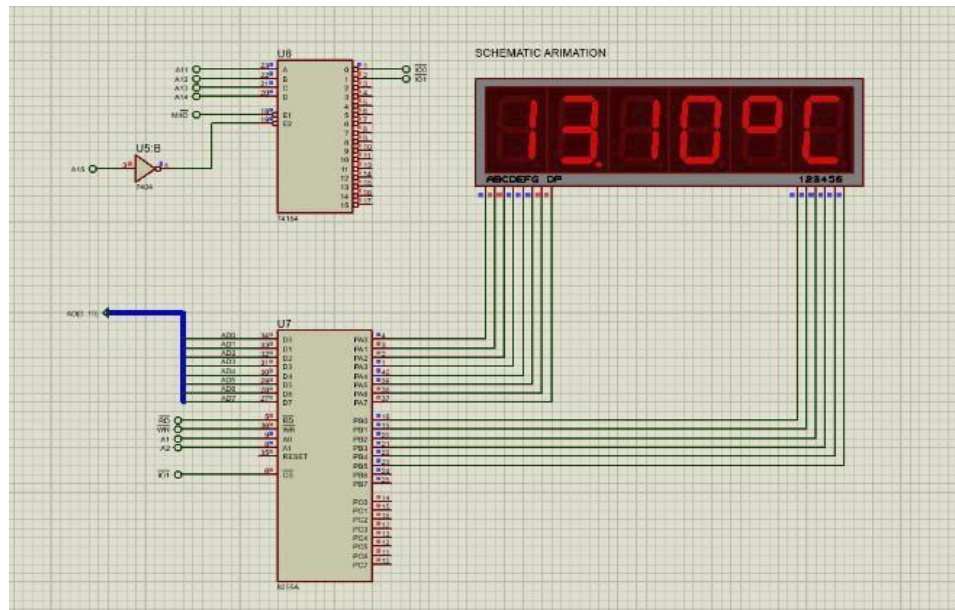
All Assemble System Design



System Simulation

Most of the problems were solved simply by paying closer attention to the guide. Setting the internal memory size to 0x100000 value also was curtail adjustment. At the beginning of my work, Proteus could not display Schematic capture window correctly. Setting the other display option reduced the program's pressure, and the window started working flawlessly. But in the end, I have been forced to set on default display options because the current setting has not been able to run animation. After all those adjustments and correction, I have finally reached a satisfying result.





Advantages and Disadvantages of using Procedures in the 8086 Microprocessor in this design

Advantages:

- Reusability of code: The procedures provide us an ease in our code by making the set of instructions reusable. So, we need not write the same set of instructions again and again when required.
- Less usage of memory: The procedure is a subprogram which is stored in the memory only one. But it can be used as many times as required. So, this occupies less memory space.
- Development becomes easier: By using procedures in a code, the modular programming can be well implemented and so, each part of the code is written in a different module which can be developed by a separate developer. So, this reduces the burden on one developer and the programming becomes simple for each of them.
- Reduced development time: As separate developers can work on different modules of programs separately; multiple developers can work on the project simultaneously which reduces the total development time of the project.

Disadvantages:

- Extra code is required to integrate the procedures: Every time a procedure is to be implemented in the program, we require CALL and RET instructions to integrate the procedures with the calling program.
- Extra time required to link the procedures: Whenever a call to procedure is made, the control of the processor goes to the procedure code, and then returns to the calling program code. This takes a lot of extra time.
- Extra load on the processor: The processor needs to do extra work to save the status of the current procedure and load status of the called procedure. Also, the instruction queue must be emptied so that the instructions of the procedure can be filled in the queue.

Advantages and disadvantages of this design

Advantages:

- It has a best quality microprocessor as 8086.
- Good accuracy.
- It has precision.

Disadvantages:

- This is expensive.
- It has a complex circuit.
- Not easy to develop.

**IV. CONCLUSION**

Temperature is one of the most important parameters to regulate in most industrial sector, such as chemical, petrochemical, food processing, pharmaceutical, and scientific research. Because certain products in these businesses demand that the proper temperature be maintained at all times, otherwise the product will fail. As a result, temperature controllers are widely employed in practically every industry and electronic device.

V. REFERENCES

1. Leading CCTV Supplier & Security System in Singapore. 2019 [cited 2019; Available from: <https://www.sg-cctv.com/>].
2. Microprocessor - Overview, in Microprocessor - Quick Guide. 2021.
3. JK Flip Flop. 2019 [cited 2019; Available from: <https://circuitglobe.com/jk-flip-flop.html>].
4. 8086 Microprocessors, in the Tech Platform. 2019.
5. Microprocessor-Quick Guide. 2021 [cited 2021; Available from: https://www.tutorialspoint.com/microprocessor/microprocessor_quick_guide.htm].
6. Sub circuits. 2019 [cited 2019; Available from: <https://www.cs.oberlin.edu/~rms/dlsim.com/uguide/uguide5.html>].

BIOGRAPHY

MD TARIQUL ISLAM Final semester Undergraduate student majoring in Mechanical Engineering at China University of Mining and Technology. His research interests include smart manufacturing, control engineering, industrial robot, and machine vision.

AKASH JOARDER Student of Mechanical Engineering at China University of Mining and Technology. Research interests on advance manufacturing, renewable energy, aerospace, control engineering, and thermal engineering.

NIAZ AHMED student of Changsha University of Science and Technology majoring in Mechanical Engineering. His research interests on automobile engineering, control system, fluid mechanics.