SODA DISPENSING

MACHINE

Submitted by: Group no.65

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# User Requirements & Technical Specifications

Design a soda dispensing machine which offers 3 choices of cool drinks and 3 choices of quantities for each drink. The quantity is dispensed when required number of five-rupee coins are entered into the machine corresponding to the quantity of drink selected.

The Technical Specifications are as follows

* Quantities offered are 50ml,100ml and 150 ml for small, medium and large respectively.
* Corresponding to each button there must an attached LED, which indicated the press of user.
* 3 more LEDs to indicate insufficiency of the drink with respect to the quantity chosen.
* Each drink must have its own dispenser.

# Assumptions & Justifications

## Justification

1. As per the coins entered by the user, the pressure range lies between 0.2 kpa and 0.7 kpa (assuming the user enters at most 3 coins) , there is need of 1 pressure sensor to cover the whole range.
2. To service the three dispensers, three motors along with attached pumps are needed.

## Assumptions

1. The user only enters five-rupee coins.
2. If extra coins are entered, they are treated as user’s loss and the selected quantity will be dispensed. However, if he enters less than the required coins, they will be treated as his loss and the drink will not be dispensed.
3. Once the tank gets empty, it needs to be refilled and quantity must be reset manually.
4. Coins are entered before the dispense button is pressed.
5. Once the drink is selected, the whole process of choosing the quantity, entering coins and pressing dispense button must be finished in a period of 30 seconds. If the dispense button is not pressed within the given time, the system will get reset and coins entered are user’s loss.
6. Motors used to dispense the cool drink pull from the tank at a constant rate, hence an accurately fixed quantity is dispensed to the user.
7. The dispensing is done in the period of 1s, 2s and 3s respectively for three sizes.
8. Inside the machine coins entered once form a stack and pressure is measured with a short delay in pressure so that impulsive force is not considered.

Components used with justification wherever required

* 8086-1 no-central processing unit for the system.
* 8284-1 no-clock generator
* ADC 0808 -1 no- 1 analog input with voltage varying from 0-5V with 8 bit resolution connected to 8255.
* 8255-2 no- Interface ADC, LEDs and switches.
* 8253-2 no- To generate clock signals for dispensers, to generate different frequency clock signals and to raise interrupt using 8259
* 8259-1 no- to generate interrupt and reset conditions when the given idle time passes.
* 2732-4 nos- we need to have even and odd bank using separate ROM chips. ROM is required at reset address which is at FFFF0H and 00000H - where there is the IVT
* 6116-2 nos-smallest available is 2k and we require two for even and odd bank. RAM is needed for temporary storage and for stack.
* LS 138 – 2nos- decoders. First for memory interfacing, second for I/O interfacing.
* LS 235, LS 245 and required gates.
* L293D – 3 nos-Motor driver to drive the dispenser. (Manual attached)
* Stepper Motor- 3 nos-Motors with attached pumps to dispense the chosen drinks.
* MPX4250 -1 no- Pressure sensor to determine the number of coins put in the machine. (Manual attached)

Pressure applied by one five-rupee coins(9 gms-before 2019 version) applies a pressure of around 0.22 kpa.

Pressure Range of MPX4250: 0-250 kpa (sufficient)

Resolution – 18.8 mv/kpa – works fine to distinguish between number of coins entered.

* Coloured LEDs -10 nos -To press of buttons and to show insufficiency of a chosen drink.
* Button -7 nos- For users to choose drinks, sizes and dispense.

# Address Map

## Memory Map

RAM1:  
Starting address – 02000H  
Ending address – 02FFFH

ROM1:  
Starting address – 00000H  
Ending address – 01FFFH

ROM 2:  
Starting address – FE000H  
Ending address – FFFFFH

## I/O  Map

Mapping of 8255(1):

00-06h

Mapping of 8255(2):

10-16h

Mapping of 8253(1):

20-26h

Mapping of 8253(2):

40-46h

Mapping of 8259:

30-32h

# Design

Complete hardware design with proper labelling is presented as an attached file in the folder.

# Flowcharts

## Main Program

Attached as a separate file in the folder - Main\_Flowchart.png

## ISR

Attached as a separate file in the folder – ISR\_Flowchart.png

# Variations in Proteus Implementation with Justification

1. Pulse generator of different frequency is used as 8284 is not available.
2. Different scale of pressure sensor- to denote the pressure of 1,2 and 3 coins as readings 1,2 and 3 for the user to understand easily.
3. Readings of stepper motor is used to indicate the working of the system and does not relate to the quantity of drink dispensed.
4. One less 8253 is used as pulse generators are directly connected to the timers and ADC.
5. ADC works slow as lower frequency is given in the proteus design and the operation of system failed on giving higher frequency in proteus.
6. In simulation, the coin readings must be chosen in the pressure sensor as the first step as ADC requires time to complete conversion.

# Firmware

Implemented using emu8086 attached.

# List of Attachments

1. Complete Hardware design-design.pdf (hand-drawn)
2. Manuals
   1. ADC 0808
   2. MPX 4250
   3. L293D – Motor Driver
   4. 74LS138 – 3X8 Decoder
   5. 74HC373 - Octal D-type Latch
   6. 74HC245 – Octal Bus Transceiver
   7. 7432 - 2-input OR gates
3. Proteus File – final\_project.dsn
4. EMU8086 ASM File – final\_project.asm
5. Binary File after assembly – final\_project.bin