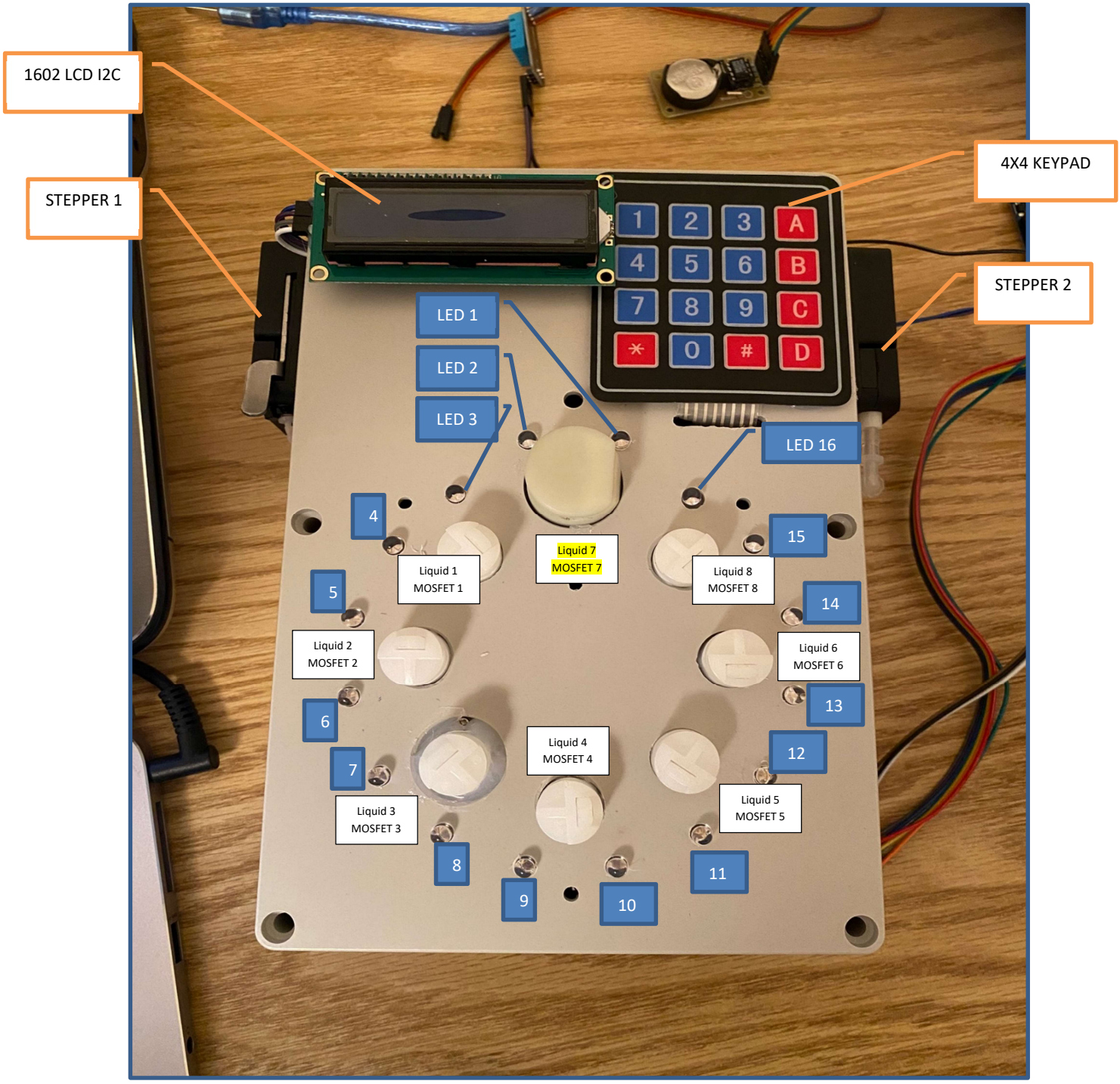
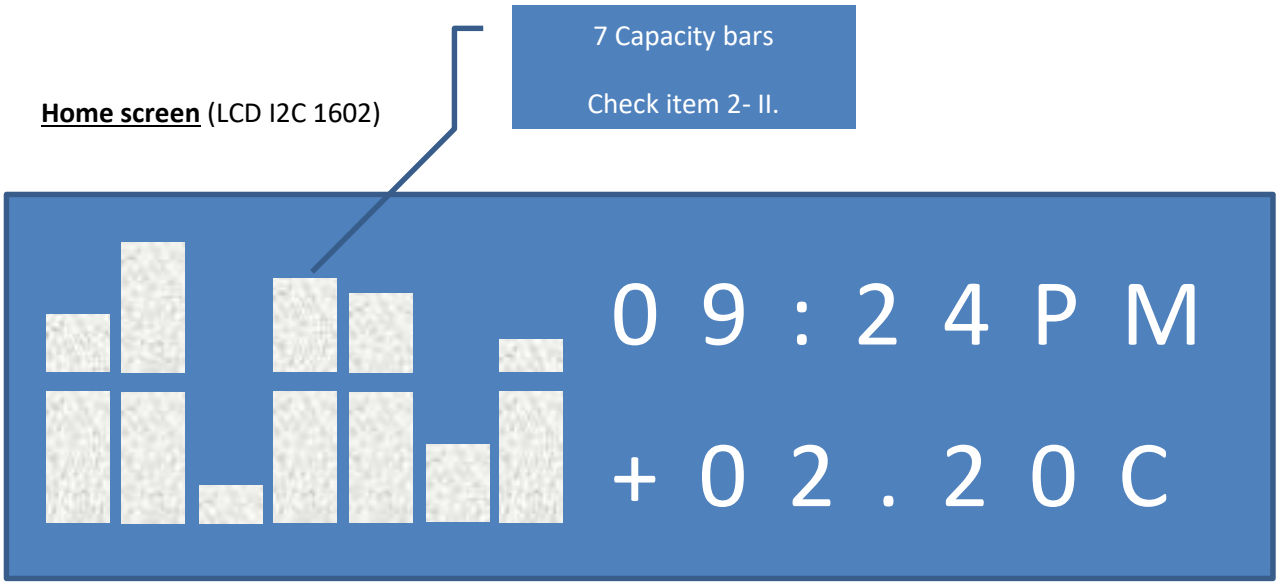


Project components:

- x8 12v valves connected to 8 MOSFETs
- x4 DC motors controlled with 2 L293D drivers
- x2 Steppers controlled by 2 A4988 drivers
- x16 LEDs controlled by 2 74HC595 chips
- 4X4 keypad
- 1602 LCD I2C
- RTC Module
- DHT11 sensor

- Arduino Mega2560
- Buck converter 12v to 5v to feed DC motors, LEDs and drivers logic.

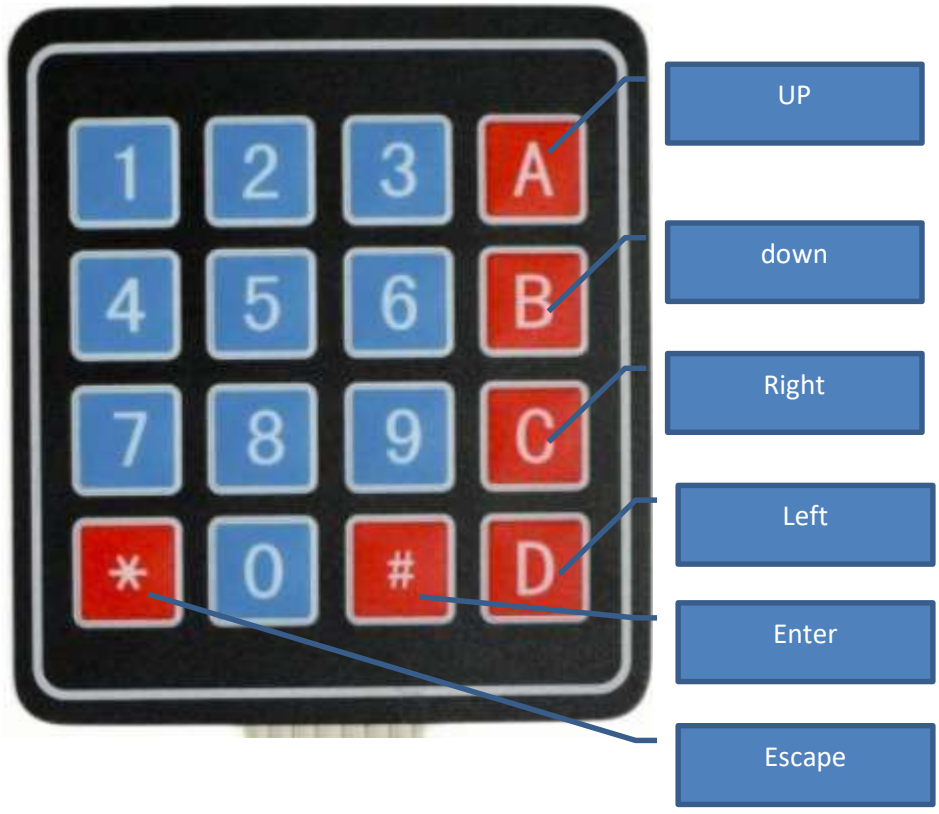
Home screen (LCD I2C 1602)



The home screen is shown by default when no activity is on the keypad for 2 minutes.

It has 7 capacity bars indicators that will reflect the remaining liquid in the 7 bottles (will be further explained down).

Keypad buttons:



Main menu:

Pressing any button on the keypad should bring up the main menu on the LCD.

The main menu is compromised of the following:

- Time & Date
- Schedule
- Quick Dose
- Flush

Flipping down and up is via buttons A and B from the keypad.

All 16 LEDs will fade on/off randomly unless a function from the below items is executing.

1- **Time & Date**:

This menu is used to set the time and date for the device. (you have the freedom to design how the menu unfolds or how the time/date is getting set). When in Time & Date submenu, all 16 LEDs fade on/off together continuously.

2- **Schedule**: the menu has the following pages:
   - Liquid 1 (when selecting this, LEDs 3&4 blink together)
   - Liquid 2 (when selecting this, LEDs 5&6 blink together)
   - Liquid 3 (when selecting this, LEDs 7&8 blink together)
   - Liquid 4 (when selecting this, LEDs 9&10 blink together)
   - Liquid 5 (when selecting this, LEDs 11&12blink together)
   - Liquid 6 (when selecting this, LEDs 13&14blink together)
   - Liquid 7 (check item 4- below) (when selecting this, LEDs 1&2 blink together)

   Each liquid page has the following (except Liquid 7):

   I. Ability to change the word "Liquid x" to any word (12 digits max) (you have the freedom to define how the renaming is done)

   II. Ability to set the total volume of the liquid which gets reflected on the capacity bars in the home screen (100 ml max). (you have the freedom to define how this volume set is done)

   III. Ability to see how much liquid is remaining in the corresponding bottle which was reflected on the capacity bar from the home screen

   IV. Ability set up to 3 dosing schedules to dose certain amount of liquid per drops {formula of how many drops per ml is listed 2- IV. d)}.

   (Void) On each scheduled time/day of week the following will happen:

   a) Corresponding dc motor will accelerate from 0 to 60% and continue running for 30 seconds (only applicable on liquid 1, 2 and 3) which equals to L293D1 output 1 (corresponds to Liquid 1), L293D1 output 2 (corresponds to Liquid 2), L293D2 (corresponds to Liquid 3),. And while this, all LEDs will run light chaser until 30 seconds are over.

b) Then, the corresponding Valve / MOSFET will activate. And the 2 corresponding LEDs will blink alternatively.
c) Then, Stepper 2 will rotate CW for 23 seconds at a speed of 600 steps a second to prime the tube
d) Then Stepper 2 will rotate CW to add the scheduled liquid amount at a rate of: at 600 step/sec speed, every 1 ml of liquid equals to 25 drops and require 18 seconds.
e) Then Stepper 2 will rotate CCW for 60 seconds at a speed of 600 steps a second to clear the tube.
f) Then, the corresponding Valve / MOSFET will deactivate. And the 2 corresponding LEDs will turn off
g) Then a Flush cycle executes:
    - All LEDs will run in a chaser from top to bottom (2, 3, 4,…., 9. And 1, 16, 15, 14,….., 10).
    - Valve 8 (or MOSFET 8) activates
    - Stepper ~~1~~ 2 will rotate CW at a rate of 600 steps/sec for 30 seconds
    - Stepper ~~1~~ 2 will rotate CCW at a rate of 600 steps/sec of 50 seconds
    - Valve 8 (or MOSFET 8) deactivates
h) The dosed amount from step d) above will be deducted from the total volume in the corresponding bottle, and the bars in the home screen gets updated.
i) All LEDs go back to fade on/off randomly.

3- Quick Dose: the menu has the following pages:

- Liquid 1 (when selecting this, LEDs 3&4 blink together)
- Liquid 2 (when selecting this, LEDs 5&6 blink together)
- Liquid 3 (when selecting this, LEDs 7&8 blink together)
- Liquid 4 (when selecting this, LEDs 9&10 blink together)
- Liquid 5 (when selecting this, LEDs 11&12blink together)
- Liquid 6 (when selecting this, LEDs 13&14blink together)
- Liquid 7 (check item 4- below) (when selecting this, LEDs 1&2 blink together)

Each Liquid page has the following (except Liquid 7):

A. Page name corresponds to the name given to it from the “Schedule” menu
B. Ability to perform items a) to i) from 2- IV. above for a giving amount of drops one time only (you have the freedom to define how this is defined).

4- Whenever Liquid 7 is encountered in the menus, it executes like as below:

I. Ability to change the word “Liquid x” to any word (12 digits max) (you have the freedom to define how the renaming is done).
II. Ability to set the total volume of the liquid which gets reflected on the capacity bars in the home screen (300ml max). (you have the freedom to define how this volume set is done)
III. Ability to see how much liquid is remaining in bottle 7 which was reflected on the capacity bar from the home screen

IV. Ability set up to 3 dosing schedules to dose certain amount of liquid per drops {formula of how many drops per ml is listed 2- IV. d)}.

(Void) On each scheduled time/day of week the following will happen:

a) DC Motor #4 will accelerate from 0 to 60 and continue to run for 30 seconds which equals to L293D2 output 2 (corresponds to Liquid 1), And all LEDs will run light chaser until 30 seconds are over.

b) Then Valve 7 (MOSFET 7) will activate. And LEDs 1&2 will blink alternatively.

c) Then Stepper 1 will rotate CW for 23 seconds at a speed of 600 steps a second to prime the tube

d) Then Stepper 1 will rotate CW to add the scheduled liquid amount at a rate of: at 600 step/sec speed, every 1 ml of liquid equals to 25 drops and require 18 seconds.

e) Then Stepper 1 will rotate CCW for 50 seconds at a speed of 600 steps a second to clear the tube

f) Then Valve 7 (or MOSFET 7) will deactivate. And LEDs 1&2 will turn off.

g) Then a Flush cycle executes:

- All LEDs will run in a chaser from top to bottom
- Valve 8 (or MOSFET 8) activates
- Stepper 1 will rotate CW at a rate of 600 steps/sec for 30 seconds
- Stepper 1 will rotate CCW at a rate of 600 steps/sec of 60 seconds
- Valve 8 (or MOSFET 8) deactivates

h) The dosed amount from step d) above will be deducted from the total volume in bottle 7, and the bars in the home screen gets updated.

i) All LEDs go back to fade on/off randomly.

V. For the quick dose menu:

a) Page name corresponds to the name given to it from the "**2- Schedule**" menu

b) Ability to perform items a) to i) from 4- IV. above for a giving amount of drops one time only (you have the freedom to define how this is defined).

5- Flush: when pressing on this menu item, you can select one of the following:

- **"Small Line":** when selecting this, a flush cycle from **2-** IV. g) above executes one time. And all LEDs will run in a chaser from top to bottom
  After its done, all LEDs go back to fade on/off randomly.
- **"Large Line":** when selecting this, a flush cycle from **4-** IV. g) above executes one time. And all LEDs will run in a chaser from top to bottom
  After its done, all LEDs go back to fade on/off randomly.

Menus breakdown:

- Time & Date (you have the freedom to define submenu and how the time/date are setup).
- Schedule
    - Liquid 1
        - Rename
        - Set Total volume
        - Current volume (xxx ml)
        - Set schedule
            - Schedule 1
                - Current schedule
                - New schedule
            - Schedule 2
                - Current schedule
                - New schedule
            - Schedule 3
                - Current schedule
                - New schedule
    - Liquid 2
        - Repeat submenus from Liquid 1
    - Liquid 3
        - Repeat submenus from Liquid 1
    - Liquid 4
        - Repeat submenus from Liquid 1
    - Liquid 5
        - Repeat submenus from Liquid 1
    - Liquid 6
        - Repeat submenus from Liquid 1
    - Liquid 7
        - Repeat submenus from Liquid 1
- Quick Dose
    - Liquid 1
        - Set dosing qty
        - Dose
    - Liquid 2
        - Set dosing qty
        - Dose
    - Liquid 3
        - Set dosing qty
        - Dose
    - Liquid 4
        - Set dosing qty
        - Dose
    - Liquid 5
        - Set dosing qty

        - Dose
    - Liquid 6
        - Set dosing qty
        - Dose
    - Liquid 7
        - Set dosing qty
        - Dose
- Flush
    - Small Line
    - Large Line