**User Manual**

This is the COMP2121 Lift Emulator system. Developed using AVR Assembly Atmega2560 Instruction Set and an Arduino Board.

**Overview:**

By default, the Lift Emulator starts on “Floor\_0” with the doors 'closed'. The Lift Emulator displays the current floor using the LCD screen with a simple “FLOOR: X” message – where X is the current floor number.

The Keypad is used to 'call' floors that the Lift will travel up or down to. There are 10 floors numbered 0-9.

The '\*' key is the Emergency Button. Pressing it stops all other operations and sends the Lift to Floor\_0. Pressing it again, leaves Emergency Mode.

The left push button (PB1) is the 'Open' button, and the right push button (PB0) is the 'Close' button.

**Usage:**

* To move up or down floors, press the button that corresponds to the floor.
* This will then indicate that the lift should stop on that floor on it's way up or down to higher or lower floors.
* Pressing the key that corresponds to the current floor will perform no actions.
* To enter/leave Emergency mode press the '\*' button.

For example starting from Floor 0:

* press 9 to go to the highest floor.
* while the lift is travelling upward, press 6 while on Floor 2,
* once the lift reaches Floor 6 it will stop and open the Lift doors to allow people to leave/enter the lift.
* It will then continue upward on it's journey to Floor 9.

Similarly the lift will work for other floors above and below your current floor.

* Press the 'Close' button (PB0) while the door is open to close it immediately
  + NOTE: This will only work when the door is ALREADY open and NOT while the door is going through it's opening operation.
* Press the 'Open' button (PB1) while the door is stopped at a floor to open the doors. Holding 'Open' will keep the doors open.

**Display:**

LCD Display:

In the default mode, the LCD display will indicate the current floor with the message:

“FLOOR: X\_”,

where 'X' is the current floor number, and '\_' is the cursor position.

In Emergency mode, the LCD will display the following message the entire time:

“Emergency

Call 000”

until the '\*' button is pressed again to leave Emergency mode.

LED Display:

The LED display serves three functions:

1. Indicates the status of the DOOR i.e. OPEN, CLOSED, MOVING (while lift is stopped)
2. Indicates the DIRECTION that the Lift is travelling in (while moving)
3. Indicates the floor that you are currently on (while moving)

DOOR Status:

* CLOSED - to indicate that the Lift doors are closed, all 10 LEDs will be lit.
* OPEN – to indicate that the lift doors are open, only the top 2 and bottom 2 LEDs will be lit.
* MOVING – when doors are “opening/closing” the pattern will be in an on/off sequence for the first five LEDs, which is then mirrored for the last five LEDs.

See below for examples of the CLOSED, OPEN, MOVING patterns. Blue indicates that the LED is lit, which that it is off.

LIFT DIRECTION and CURRENT FLOOR:

When the lift is travelling upwards or downwards, the LEDs will switch to show 1 LED bar turned on. This single LED bar indicates the CURRENT FLOOR that the lift is on.

If moving upwards, the LED will move upwards to indicate that the lift is travelling in that direction, and vice versa when travelling downwards.

The default LED display is the “closed” door pattern. When the lift is called to a floor the LED changes display based on what's needed. Generally the display will be shown as follows:

* Initally shows “closed” pattern
* LED display changes to single bar indicating current floor
* Single bar is shifted upward/downward to indicate direction
* If Lift has reached the called floor, then the display shows patterns in the sequence:
  + DOORS MOVING for 1 second
  + DOORS OPEN for 3 seconds
  + DOORS MOVING for 1 second
* DOORS CLOSED

This pattern is repeated for all movements travelling up and down the Lift Emulator. The exception to this is if the Open or Close buttons are used which will then open/close the doors showing the corresponding patterns as desired.

MOTOR:

During lift motion, the MOTOR will run at full speed for 2 seconds to indicate the lift is travelling between floors.

STROBE LIGHT:

The strobe light blinks several times per second during Emergency mode, for the duration of Emergency mode. When the user leaves Emergency mode, the strobe light is turned off as well.

**Wiring:**

Connect the COMP2121 Arduino Board as follows:

**PORTF** <=> **LCD** **DATA**

PF0-7 <=> D0-7

**LCD CRTL**

BE <=> PA4

RW <=> PA5

E <=> PA6

RS <=> PA7

BL <=> PE5

**KEYPAD** <=> **PORTL**

C0-3 <=> PL0-3

R0-3 <=> PL4-7

**LED BAR** <=> **PORTC/PORTG**

LED0 <=> PG3 [RED LED – FIRST FROM TOP]

LED1 <=> PG2 [ORANGE LED – SECOND FROM TOP]

LED2-9 <=> PC0-7

**PUSH BUTTONS** <=> **PORTD**

PB0 <=> RDX4

PB1 <=> RDX3

**MOTOR**

MoT <=> PE2

**STROBE LIGHT**

LED <=> PB1

OpO <=> TDX2

OpE <=> +5V