**PO1\_DGC\_Digital Calculator**

**HSI Document**

**Version 1.2**

**Draft**

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| 1.0 | Esraa Awad | 23/1/2020 | Initial creation | Draft |
| 1.1 | Esraa Awad | 30/1/2020 | -Change in Requirement`s names.  -Change in system hardware block diagram adding external switch for powering LCD on and off. | Proposed |
| 1.2 | Esraa Awad | 1/2/2020 | Adding a tactile switch in pin configurations and hardware description tables | Proposed |

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# 1- Hardware Description

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| Hardware | Description |
| AVR ATmega32 (MCU) | Low-power Microchip 8-bit AVR  RISC-based microcontroller  Program Memory Size 32 (KB)  Pin Count 44 |
| LCD (LMB161A) | LCD Mode: STN Positive Transflective  Display Color: Dark Blue  Background Color: Yellow-Green  Driving Duty: 1/16 Duty  Viewing Direction: 6:00  Backlight : LED |
| 4\*4 Keypad | Four rows of matrix and four are columns of matrix.  8 pins are driven out from 16 buttons present in the module. |
| Buzzer | Resonant: 2300 +/-300HZ  Frequency: 2300 +/- 300 HZ  Rated Voltage: 5V  Voltage range: 4: 8 V  Rated Current: 30 ma  Min Sound output at 10 cm: 85 dB |
| Tactile switch | tactile switch button is released and the pressure has been taking off has 2 pins one for gnd and other for volt. |

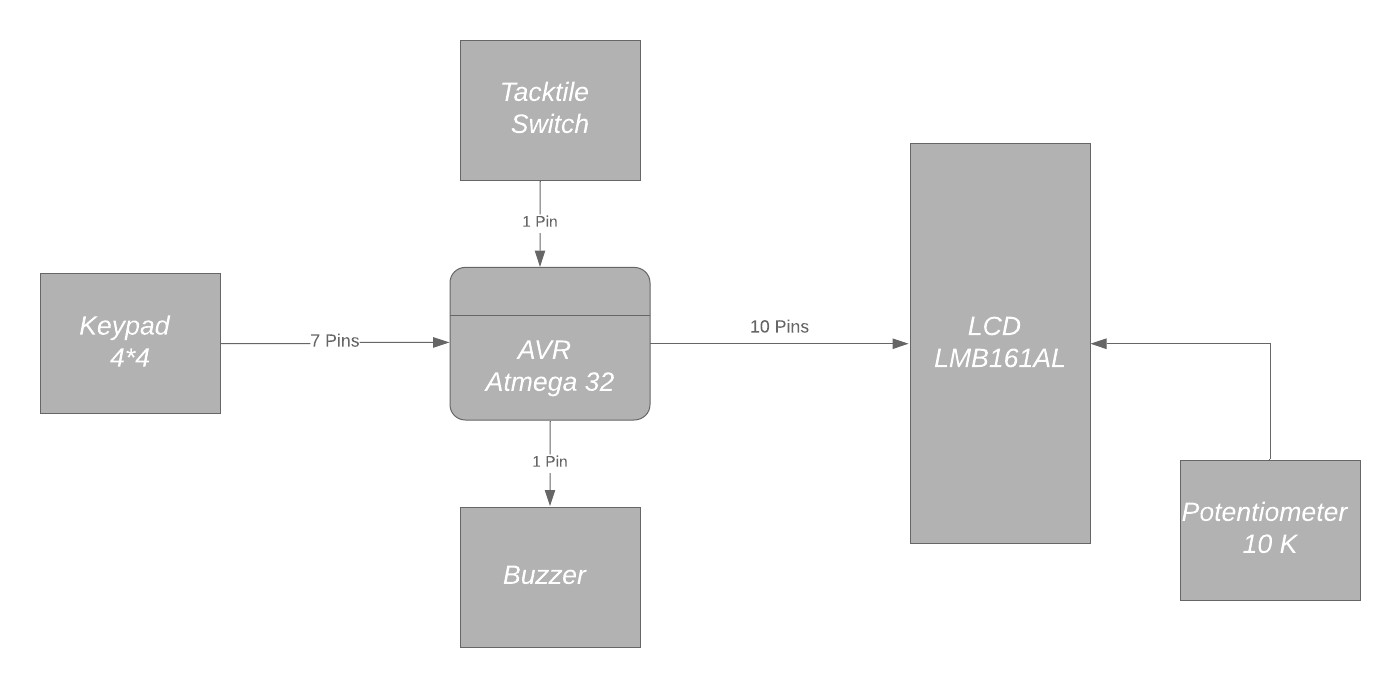


Figure System hardware block diagram

# 2- Pins Configuration (ATmega32 AVR):

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| PORT | Configuration |
| PORTA | Pins (0:7 output) connected to data pins of LCD. |
| PORTB | Pins (0:3 output) connected to control pins of LCD. |
| PORTC | Pins (0:7) connected to Keypad pins rows (0:3 Output) and columns (4:7 Inputs). |
| PORTD | (1 Pin output) connected to Buzzer and (1 pin input) connected to tactile switch. |

# 3- Features description

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| --- | --- |
| Requirement Name | Hardware Requirement Description |
| Req\_PO1\_DGC\_HSI\_001\_V01 | Keypad consists of 10 numbers (0:9), basic operation keys (+-/\*) and clear key, its eight pins are connected to  MCU. |
| Req\_PO1\_DGC\_HSI\_002\_V01 | Buzzer has 2 pins one GND and the other connected to MCU as output. |
| Req\_PO1\_DGC\_HSI\_003\_V01 | Micro controller 8-bit AVR ATmega32 has 32 DIO pins |
| Req\_PO1\_DGC\_HSI\_004\_V01 | LCD has 3 control pins and 8 pins for data to be displayed on its screen. |
| Req\_PO1\_DGC\_HSI\_005\_V01 | A tactile switch has 2 pins one GND and the other connected to MCU as input for switching LCD on and off. |