**PO1\_DGC\_Digital Calculator**

**GDD Document**

**Version 1.1**

**Proposed**

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| **Version** | **Author** | **Date** | **Change** | **Status** |
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| 1.0 | - Alzahraa Elsallakh | 24/1/2020 | * Initial creation | Draft |
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# **Project Description**

This project is a digital calculator that takes input from user and displays the input and the result on a screen.

The hardware used in the calculator is Keypad which takes input from user, LCD to display the result, buzzer to generate tunes on each key press and micro controller that performs all operations in the system.

## **Software Context Diagram**

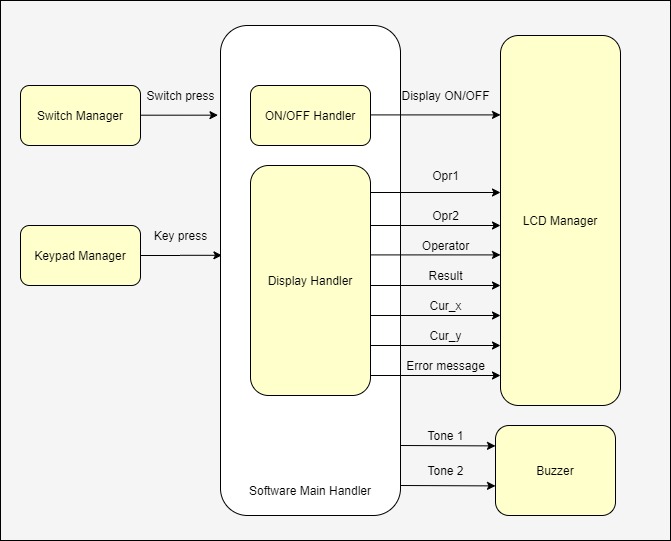


Figure ‑ Software Context Diagram

# **Input and Output Signals**

The input and output signals in the project are listed below in figures, with explained information about each signal.

## **Activation Control Signals**

Input signal: Signal\_SwitchPressed

Output signal: Signal\_OnOffState

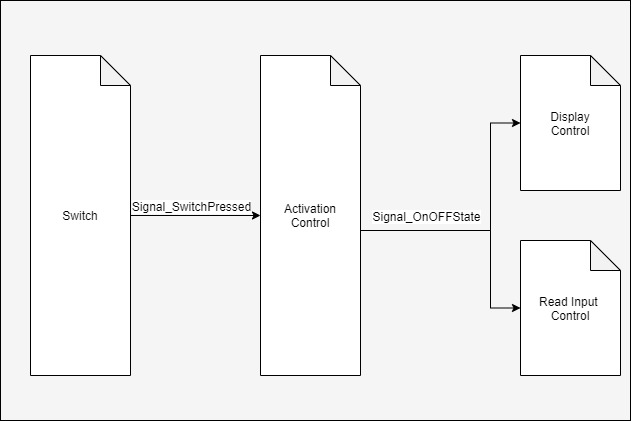


Figure ‑ Activation Control Signals

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Signal\_SwitchPressed | |  | Signal\_OnOffState | |
| Range | [0,1] |  | Range | [0,1] |
| Unit | Unsigned char |  | Unit | Unsigned char |

## **Read Input Control Signals**

Input signals: Signal\_OnOffState, Signal\_KeyPressed

Output signal: Signal\_Op1, Signal\_Op2, Signal\_Operator, Signal\_Tone

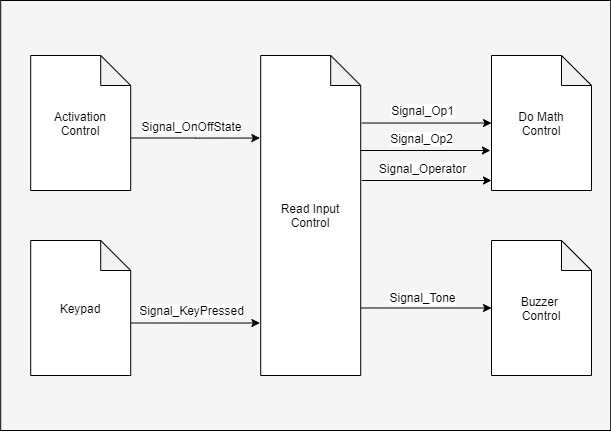


Figure ‑ Read Input Control Signals

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Signal\_OnOffState | |  | Signal\_KeyPressed | |
| Range | [0,1] |  | Range | {0…9, A…D, \*, #} |
| Unit | Unsigned char |  | Unit | Unsigned char |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Signal\_Op1 | |  | Signal\_Op2 | |
| Range | [0.0 – 999.99] |  | Range | [0.0 – 999.99] |
| Unit | Signed char |  | Unit | Signed char |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Signal\_Operator | |  | Signal\_Tone | |
| Range | {A…D, \*,#} |  | Range | [1,2] |
| Unit | Unsigned char |  | Unit | Unsigned char |

## **Buzzer Control Signals**

Input signals: Signal\_Tone

Output signal: Signal\_RunningTone

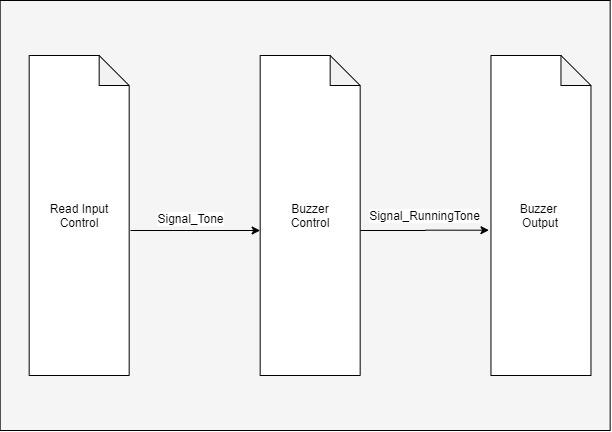


Figure ‑ Buzzer Control Signals

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Signal\_Tone | |  | Signal\_RunningTone | |
| Range | [1,2] |  | Range | [0,1] |
| Unit | Unsigned char |  | Unit | Unsigned char |

## **Do Math Control Signals**

Input signals: Signal\_Op1, Signal\_Op2, Signal\_Operator

Output signal: Signal\_DisplayedMsg

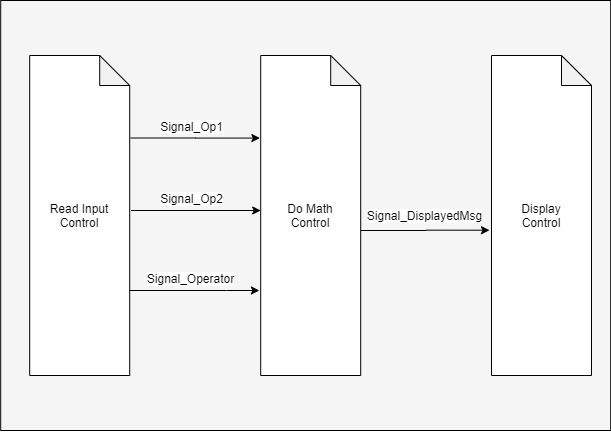


Figure ‑ Do Math Control Signals

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Signal\_Op1 | |  | Signal\_Op2 | |
| Range | [0.0 – 999.99] |  | Range | [0.0 – 999.99] |
| Unit | Signed char |  | Unit | Signed char |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Signal\_Operator | |  | Signal\_DisplayedMsg | |
| Range | {A…D, \*,#} |  | Range | Strings, numbers, operators |
| Unit | Unsigned char |  | Unit | Unsigned char |

## **Display Control Signals**

Input signals: Signal\_OnOffState, Signal\_DisplayedMsg

Output signal: Signal\_OnOffState, Signal\_DisplayedMsg

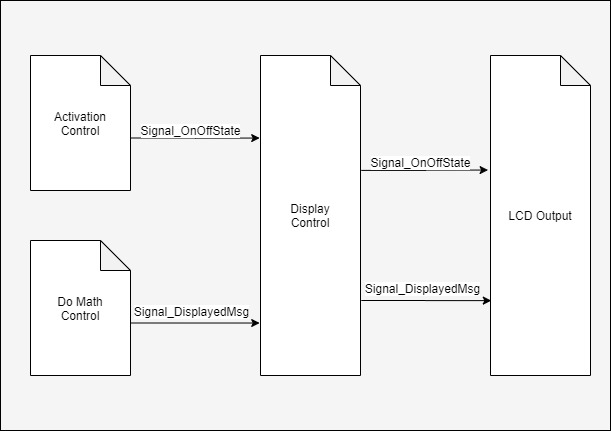


Figure ‑ Display Control Signals

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Signal\_OnOffState | |  | Signal\_DisplayedMsg | |
| Range | [0,1] |  | Range | Strings, numbers, operators |
| Unit | Unsigned char |  | Unit | Unsigned char |

# **Software Features**

The software features that maps between all software blocks and shows communication between them is shown in Figure ‎3‑1.

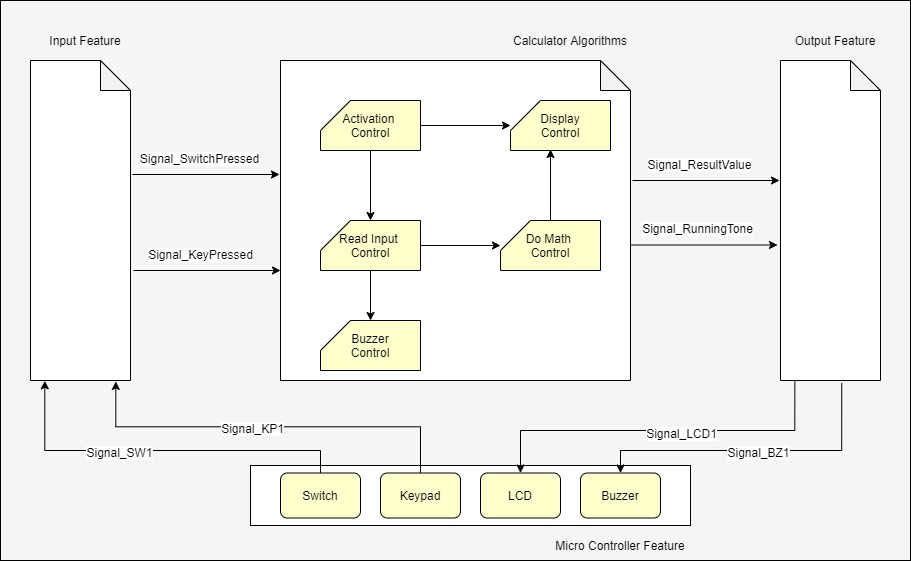


Figure ‑ Software Features

# **Static Architecture**

## **Layered Architecture**

The layered architecture represents the architecture of the project as separate horizontal layers, and shows the dependency of each module in any layer on other modules as shown in Figure ‎2‑1

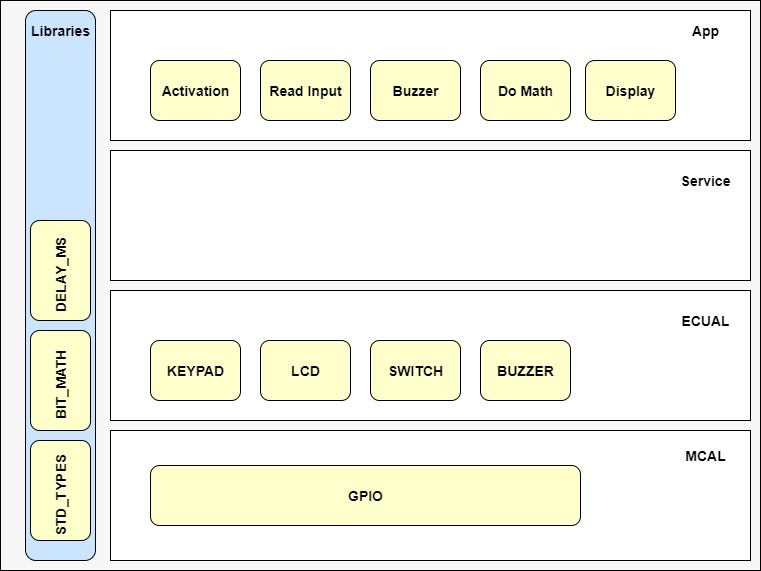


Figure ‑ Project Layered Architecture

# **Components**

Clarifying the components mentioned in the layered architecture, their public API’s, arguments, return value and requirements covered.