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# PO1\_DGC Calculator

**(GDD)**

**Status**: **Draft**

### **Document Status**

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| --- | --- | --- | --- |
| **Version** | **Status** | **Author** | **Date** |
| 1.0 | Draft | May Abdelsalam | 26/2/2020 |
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**History Table**

|  |  |  |  |
| --- | --- | --- | --- |
| **Version** | **Author** | **Date** | **Change** |
| 1.0 | May Abdelelsalam | 26/2/2020 | Initial creation |
| 1.0 | Moamen Ahmed | 27/2/2020 | Added HAL APIs |
| 1.0 | May Abdelelsalam | 27/2/2020 | Update on Input Output signals, Static Architecture |
| 1.0 | Areej Ayman Helal | 27/2/2020 | Added App APIs. |
| 1.0 | Bishoy Nabil | 27/2/2020 | Added MCAL APIs |
| 1.1 | Moamen Ahmed | 2/3/2020 | Added covers section to all requirements |
| 1.2 | May Abdelelsalam | 2/3/2020 | Added Input Output signals section and Software Features section |
| 1.3 | Moamen Ahmed | 2/3/2020 | Added new APIs and updated Covers section |
| 1.4 | Moamen Ahmed | 6/3/2020 | Minor changes to Req\_PO1\_DGC\_GDD\_006 |
| 1.5 | Moamen Ahmed | 13/3/2020 | Added Component section to each GDD requirement |

**Reference documents**

|  |  |  |  |
| --- | --- | --- | --- |
| **Reference number** | **Document name** | **Version** | **Status** |
| 1 | PO1\_DGC Calculator  (SRS) | V1.7 | Proposed |

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## Project Description

The Digital Calculator system will consist of a Power component in the APP layer to turn all the system ON whenever the ON switch is pressed.

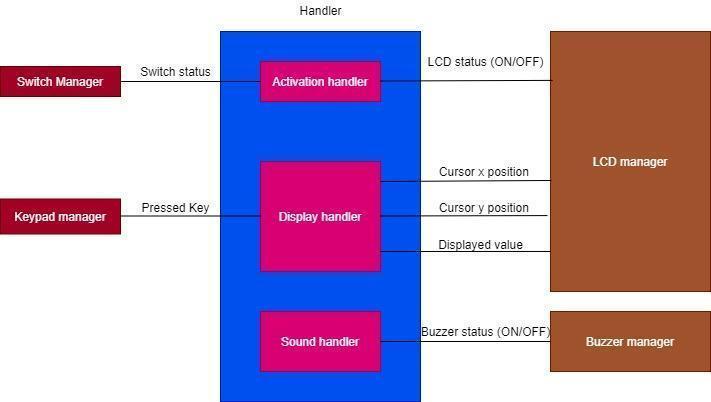
The system starts with the Keypad\_assignment component waiting for any of the Keypad keys to get pressed. When a switch of the keypad is pressed the Keypad\_assignment component will send signals to all of the following components:

1- Math\_calc: will calculate the entered operation and send the result to the Display component.

2- Display: will display the entered first operand, operation and second operand.

3- PlayTone: will play a tune every time keypad\_assignment component is used.

## Software context diagram:



**Input Output signals:**

Input signals:

* Switch status.

Range: [0: 1]

Unit: NA

* Pressed Key:

Range: [0: 15]

Unit: NA

Output signals:

* LCD Status.

Range: [0: 1]

Unit: NA

* Curser X Position:

Range: [0: 15]

Unit: NA

* Curser Y Position:

Range: [0: 1]

Unit: NA

* Displayed value:

Range: [0: 9, +, -, \*, /, =]

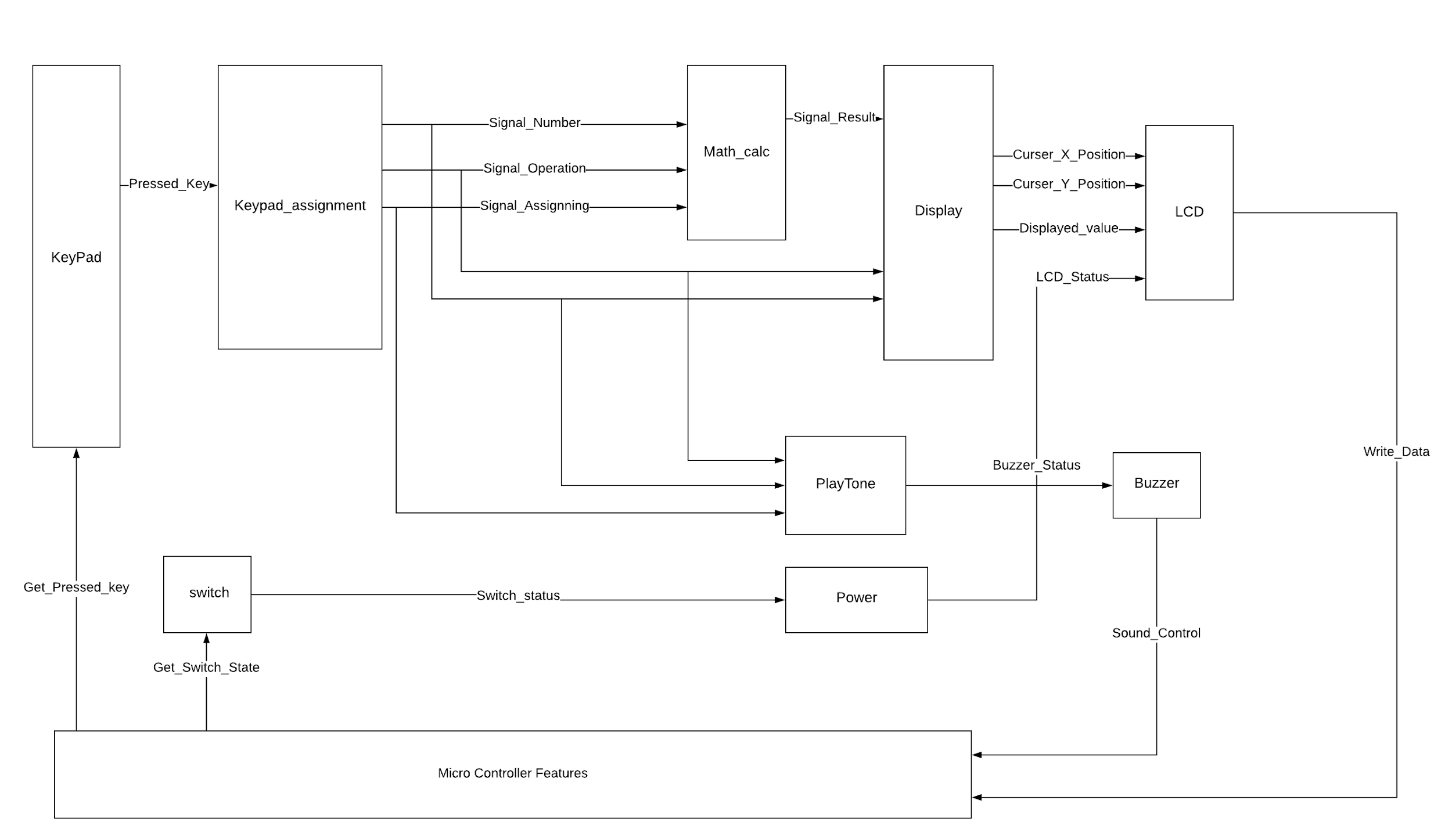
Unit: NA

* Buzzer Status.

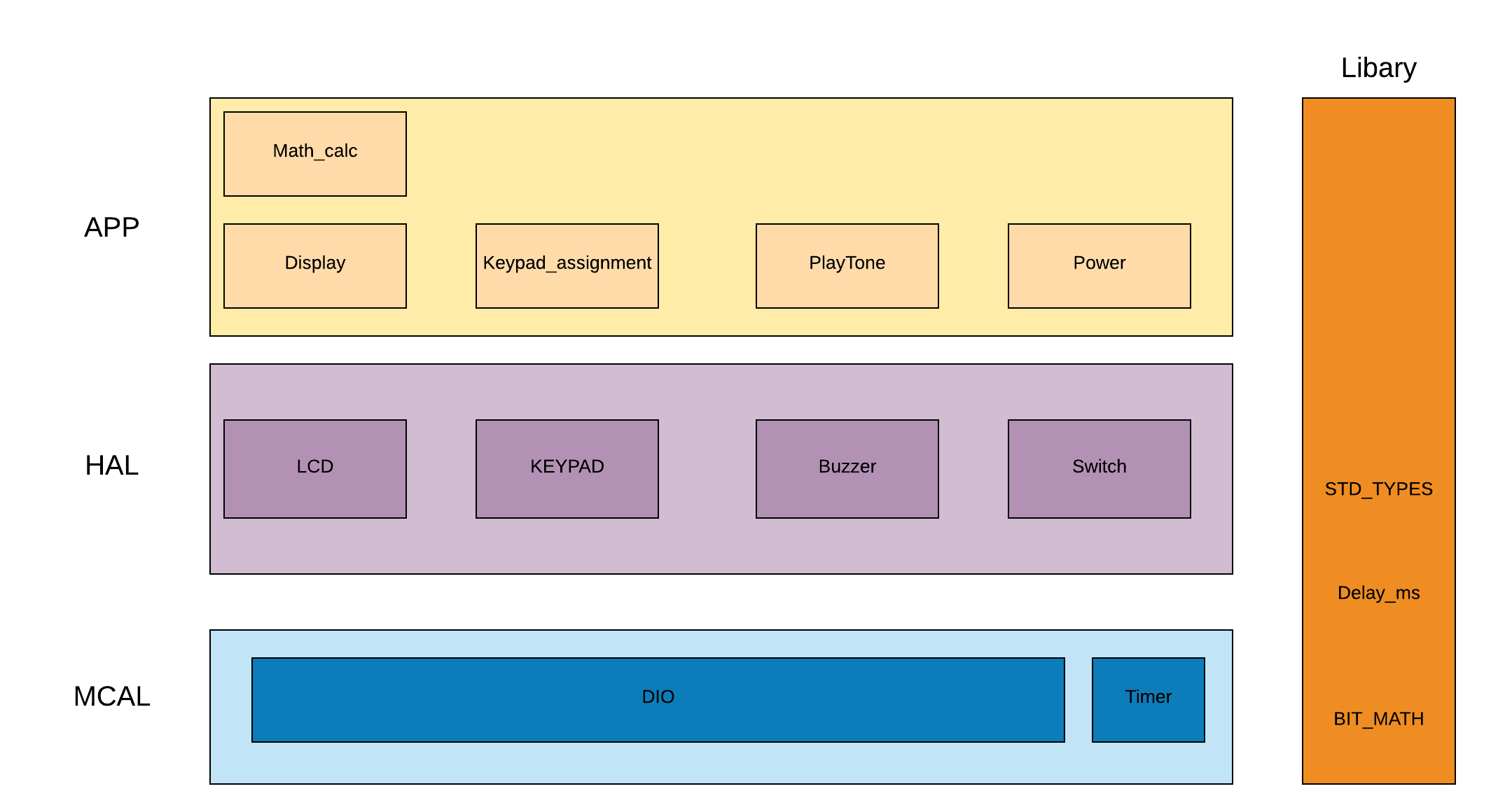
Range: [0: 1]

Unit: NA

**Software features:**

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**Static Architecture:**



### **APP Components APIs:**

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| --- | --- | --- | --- |
| **Req\_ID** | Req\_PO1\_DGC\_GDD\_001 V1.4 | | |
| **Component** | Keypad\_assignment | | |
| **Return Type** | STD\_ERR | **Input arguments** | u8 Copy\_u8PressedKey  u8\* Copy\_u8CalculatorKey |
| **Name** | DGC\_KeypadAssignment | | |
| **Description** | It takes the pressed key as an input (1:16) and returns the corresponding number | | |
| **Covers** | Req\_PO1\_DGC\_SRS\_001\_v1.3 | | |
| **Range** | Copy\_u8PressedKey : (1:16)  Copy\_u8CalculatorKey: (0:9,+,-,\*,/,=)  return : OK, NOT\_OK | | |

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| --- | --- | --- | --- |
| **Req\_ID** | Req\_PO1\_DGC\_GDD\_002 V1.4 | | |
| **Component** | Math\_calc | | |
| **Return Type** | STD\_ERR | **Input arguments** | f32\* Copy\_f32Result |
| **Name** | DGC\_GetResult | | |
| **Description** | Returns the result of the operation. | | |
| **Covers** | Req\_PO1\_DGC\_SRS\_015\_v1.3  Req\_PO1\_DGC\_SRS\_016\_v1.3  Req\_PO1\_DGC\_SRS\_017\_v1.3 | | |
| **Range** | Copy\_f32Result (float range)  return : (OK, NOT\_OK) | | |

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| --- | --- | --- | --- |
| **Req\_ID** | Req\_PO1\_DGC\_GDD\_003 V1.0 | | |
| **Component** | Math\_calc | | |
| **Return Type** | STD\_ERR | **Input arguments** | u8 Copy\_u8Operand |
| **Name** | DGC\_AssignOperands | | |
| **Description** | Assigns the input as first/second operand or operation. | | |
| **Covers** | Req\_PO1\_DGC\_SRS\_003\_v1.3  Req\_PO1\_DGC\_SRS\_005\_v1.3  Req\_PO1\_DGC\_SRS\_007\_v1.3  Req\_PO1\_DGC\_SRS\_008\_v1.3  Req\_PO1\_DGC\_SRS\_013\_v1.3  Req\_PO1\_DGC\_SRS\_014\_v1.3  Req\_PO1\_DGC\_SRS\_016\_v1.3  Req\_PO1\_DGC\_SRS\_018\_v1.3  Req\_PO1\_DGC\_SRS\_019\_v1.3 | | |
| **Range** | Copy\_u8Operand (0:9,+,-,\*,/)  return : (OK, NOT\_OK) | | |

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| **Req\_ID** | Req\_PO1\_DGC\_GDD\_004 V1.4 | | |
| **Component** | Display | | |
| **Return Type** | STD\_ERR | **Input arguments** | u8 Copy\_u8Char |
| **Name** | DGC\_DisplayChar | | |
| **Description** | Display a single character on the LCD | | |
| **Covers** | Req\_PO1\_DGC\_SRS\_002\_v1.3  Req\_PO1\_DGC\_SRS\_004\_v1.3  Req\_PO1\_DGC\_SRS\_006\_v1.3  Req\_PO1\_DGC\_SRS\_009\_v1.3  Req\_PO1\_DGC\_SRS\_010\_v1.3 | | |
| **Range** | Copy\_u8Char: (0:9,+,-,\*,/)  return : (OK, NOT\_OK) | | |

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| **Req\_ID** | Req\_PO1\_DGC\_GDD\_005 V1.4 | | |
| **Component** | Display | | |
| **Return Type** | STD\_ERR | **Input Arguments** | f32 Copy\_f32Number |
| **Name** | DGC\_DisplayNumber | | |
| **Description** | Display a base 10 number on the LCD. | | |
| **Covers** | Req\_PO1\_DGC\_SRS\_016\_v1.3  Req\_PO1\_DGC\_SRS\_017\_v1.3 | | |
| **Range** | Copy\_f32Number (float range)  return : (OK, NOT\_OK) | | |

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| --- | --- | --- | --- |
| **Req\_ID** | Req\_PO1\_DGC\_GDD\_006 V1.4 | | |
| **Component** | PlayTone | | |
| **Return Type** | STD\_ERR | **Input arguments** | void |
| **Name** | DGC\_PlayTone | | |
| **Description** | Plays a tone whenever a key is press on the keypad | | |
| **Covers** | Req\_PO1\_DGC\_SRS\_011\_v1.3  Req\_PO1\_DGC\_SRS\_012\_v1.3 | | |
| **Range** | return : (OK, NOT\_OK) | | |

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| **Req\_ID** | Req\_PO1\_DGC\_GDD\_007 V1.3 | | |
| **Component** | Power | | |
| **Return Type** | STD\_ERR | **Input arguments** | u8 Copy\_u8PState |
| **Name** | DGC\_Power | | |
| **Description** | It turns the system on or off whether it's from the power button or if the system idles for 15 seconds . | | |
| **Covers** | Req\_PO1\_DGC\_SRS\_020\_v1.3 | | |
| **Range** | Copy\_u8PState: (0,1)  return : (OK, NOT\_OK) | | |

### **HAL Components APIs**

|  |  |  |  |
| --- | --- | --- | --- |
| **Req\_ID** | Req\_PO1\_DGC\_GDD\_008 V1.1 | | |
| **Component** | LCD | | |
| **Return Type** | STD\_ERR | **Input arguments** | void |
| **Name** | LCD\_Init | | |
| **Description** | Initialize LCD with determined configurations | | |
| **Covers** | - | | |
| **Range** | return : (OK, NOT\_OK) | | |

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| --- | --- | --- | --- |
| **Req\_ID** | Req\_PO1\_DGC\_GDD\_009 V1.1 | | |
| **Component** | LCD | | |
| **Return Type** | STD\_ERR | **Input arguments** | u8 Copy\_u8Command |
| **Name** | LCD\_WriteCommand | | |
| **Description** | Control the LCD using the commands found in the LCD datasheet | | |
| **Covers** | - | | |
| **Range** | Copy\_u8Command: (0-255)  return : (OK, NOT\_OK) | | |

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| --- | --- | --- | --- |
| **Req\_ID** | Req\_PO1\_DGC\_GDD\_010 V1.1 | | |
| **Component** | LCD | | |
| **Return Type** | STD\_ERR | **Input arguments** | u8 Copy\_u8Data |
| **Name** | LCD\_WriteData | | |
| **Description** | Write a single character to the LCD | | |
| **Covers** | Req\_PO1\_DGC\_SRS\_002\_v1.3  Req\_PO1\_DGC\_SRS\_004\_v1.3  Req\_PO1\_DGC\_SRS\_006\_v1.3  Req\_PO1\_DGC\_SRS\_009\_v1.3  Req\_PO1\_DGC\_SRS\_010\_v1.3 | | |
| **Range** | Copy\_u8Data: (0-255)  return : (OK, NOT\_OK) | | |

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| --- | --- | --- | --- |
| **Req\_ID** | Req\_PO1\_DGC\_GDD\_011 V1.1 | | |
| **Component** | KEYPAD | | |
| **Return Type** | STD\_ERR | **Input arguments** | u8\* Copy\_u8KeyPressed |
| **Name** | KEYPAD\_GetPressedKey | | |
| **Description** | Returns the current pressed key(1:16) or returns 0 if no key is pressed | | |
| **Covers** | Req\_PO1\_DGC\_SRS\_001\_v1.3  Req\_PO1\_DGC\_SRS\_003\_v1.3  Req\_PO1\_DGC\_SRS\_005\_v1.3  Req\_PO1\_DGC\_SRS\_007\_v1.3  Req\_PO1\_DGC\_SRS\_008\_v1.3  Req\_PO1\_DGC\_SRS\_013\_v1.3  Req\_PO1\_DGC\_SRS\_014\_v1.3  Req\_PO1\_DGC\_SRS\_015\_v1.3  Req\_PO1\_DGC\_SRS\_016\_v1.3  Req\_PO1\_DGC\_SRS\_018\_v1.3  Req\_PO1\_DGC\_SRS\_019\_v1.3 | | |
| **Range** | Copy\_u8KeyPressed: (0-16)  return : (OK, NOT\_OK) | | |

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| **Req\_ID** | Req\_PO1\_DGC\_GDD\_012 V1.1 | | |
| **Component** | BUZZER | | |
| **Return Type** | STD\_ERR | **Input arguments** | void |
| **Name** | BUZZER\_SetBuzzerOn | | |
| **Description** | Turn on the buzzer by outputting a high signal on the buzzer pin | | |
| **Covers** | Req\_PO1\_DGC\_SRS\_011\_v1.3  Req\_PO1\_DGC\_SRS\_012\_v1.3 | | |
| **Range** | return : (OK, NOT\_OK) | | |

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| **Req\_ID** | Req\_PO1\_DGC\_GDD\_013 V1.1 | | |
| **Component** | BUZZER | | |
| **Return Type** | STD\_ERR | **Input arguments** | void |
| **Name** | BUZZER\_voidSetBuzzerOff | | |
| **Description** | Turn off the buzzer by outputting a low signal on the buzzer pin | | |
| **Covers** | Req\_PO1\_DGC\_SRS\_011\_v1.3  Req\_PO1\_DGC\_SRS\_012\_v1.3 | | |
| **Range** | return : (OK, NOT\_OK) | | |

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| **Req\_ID** | Req\_PO1\_DGC\_GDD\_014 V1.1 | | |
| **Component** | SWITCH | | |
| **Return Type** | STD\_ERR | **Input arguments** | u8 \*Copy\_SwitchStatus |
| **Name** | SWITCH\_GetSwitchStatus | | |
| **Description** | Returns 1 if the switch is pressed or 0 otherwise | | |
| **Covers** | - | | |
| **Range** | Copy\_SwitchStatus: (0,1)  return : (OK, NOT\_OK) | | |

### **MCAL Components APIs**

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| --- | --- | --- | --- |
| **Req\_ID** | Req\_PO1\_DGC\_GDD\_015 V1.1 | | |
| **Component** | DIO | | |
| **Return Type** | STD\_ERR | **Input arguments** | void |
| **Name** | DIO\_Init | | |
| **Description** | Initialize all pins and ports to their operation mode and initial values | | |
| **Covers** | - | | |
| **Range** | return : (OK, NOT\_OK) | | |

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| **Req\_ID** | Req\_PO1\_DGC\_GDD\_016 V1.1 | | |
| **Component** | DIO | | |
| **Return Type** | STD\_ERR | **Input arguments** | u8 Copy\_u8Port u8 Copy\_u8Pin u8 Copy\_u8Mode |
| **Name** | DIO\_SetPinMode | | |
| **Description** | Checks which Port and which Pin and set its Mode if the function done its purpose return OK if not return NOT\_OK | | |
| **Covers** | - | | |
| **Range** | Copy\_u8Port: (PORTA=0,PORTB=1,PORTC=2,PORTD=3)  Copy\_u8Pin: (0:7)  Copy\_u8Mode(OP=1,IP=0)  return : (OK, NOT\_OK) | | |

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| **Req\_ID** | Req\_PO1\_DGC\_GDD\_017 V1.1 | | |
| **Component** | DIO | | |
| **Return Type** | STD\_ERR | **Input arguments** | u8 Copy\_u8Port u8 Copy\_u8Pin u8 Copy\_u8Value |
| **Name** | DIO\_SetPinValue | | |
| **Description** | Checks which Port and which Pin and set it or reset it if the function done its purpose return OK if not return NOT\_OK | | |
| **Covers** | - | | |
| **Range** | Copy\_u8Port: (PORTA=0,PORTB=1,PORTC=2,PORTD=3)  Copy\_u8Pin: (0:7)  Copy\_u8Value(HIGH=1,LOW=0)  return : (OK, NOT\_OK) | | |

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| **Req\_ID** | Req\_PO1\_DGC\_GDD\_018 V1.1 | | |
| **Component** | DIO | | |
| **Return Type** | STD\_ERR | **Input arguments** | u8 Copy\_u8Port u8 Copy\_u8Pin u8\* Copy\_u8ValuePtr |
| **Name** | DIO\_GetPinValue | | |
| **Description** | Checks which Port and which Pin and reads its value and returns it in “Copy\_u8ValuePtr” pointer if the function done its purpose return OK if not return NOT\_OK | | |
| **Range** | Copy\_u8Port: (PORTA=0,PORTB=1,PORTC=2,PORTD=3)  Copy\_u8Pin: (0:7)  Copy\_u8ValuePtr: (HIGH=1,LOW=0)  return : (OK, NOT\_OK) | | |

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| **Req\_ID** | Req\_PO1\_DGC\_GDD\_019 V1.1 | | |
| **Component** | TIMER | | |
| **Return Type** | STD\_ERR | **Input arguments** | u8 Copy\_u8TimerNum |
| **Name** | TIMER\_Init | | |
| **Description** | Initialize Timer\_0. if the function done its purpose return OK if not return NOT\_OK | | |
| **Covers** | - | | |
| **Range** | Copy\_u8TimerNum: (0-255)  return : (OK, NOT\_OK) | | |

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| --- | --- | --- | --- |
| **Req\_ID** | Req\_PO1\_DGC\_GDD\_020 V1.1 | | |
| **TIMER** |  | | |
| **Return Type** | STD\_ERR | **Input arguments** | u8 Copy\_u8TimerNum u8 Copy\_u8Preload |
| **Name** | TIMER\_SetPreloadValue | | |
| **Description** | Checks which Timer and sets its preload value if the function done its purpose return OK if not return NOT\_OK | | |
| **Covers** | - | | |
| **Range** | Copy\_u8TimerNum: (0-255)  Copy\_u8Preload: (0-255)  return : (OK, NOT\_OK) | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Req\_ID** | Req\_PO1\_DGC\_GDD\_021 V1.1 | | |
| **Component** | TIMER | | |
| **Return Type** | STD\_ERR | **Input arguments** | u8 Copy\_u8TimerNum void (\*Copy\_CallBackPtr)(void) |
| **Name** | TIMER\_SetCallBack | | |
| **Description** | Checks which Timer and sets its Call Back Function. if the function done its purpose return OK if not return NOT\_OK | | |
| **Covers** | Req\_PO1\_DGC\_SRS\_0020\_v1.3 | | |
| **Range** | Copy\_u8TimerNum: (0-255)  Copy\_CallBackPtr: pointer to callback function  return : (OK, NOT\_OK) | | |