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| --- | --- |
| **Title:** | **WINLIFT**  **SW Component < XXXXXXX >** |

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| --- | --- | --- | --- | --- |
| **History** | | | | |
| **Issue status**  (Index) | **Maturity/Date**  (draft/invalid/valid)  (dd-mmm-yyyy) | **Author**  Department | **Check/Release**  Department | **Description** |
| 6 | Draft  2-Nov-15 | Oscar Miranda  B.S. | Oscar Miranda  B.S. | Only the return value of countPressTime was changed. |

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# Purpose

The purpose of this project is develop a software, for an embedded system, that controls a car window movement, with anti-pitch security function. The software will be implemented in a MPC5606B Freescale development board.

# Definitions and abbreviations

**Definitions**

|  |  |
| --- | --- |
| WINLIFT  GPIO  ISR  STM | Name of the project, which means Window Lifter  General purpose inputs and outputs  Interrupt Service Routine  System Timer Module |
| API | May refer to Application Programming Interface or Application Layer |
| HAL | Hardware Abstraction Layer |
| MCAL | Microcontroller Abstraction Layer |
|  |  |

**Abbreviations**

Only SW Component specific abbreviations.

**References**

|  |  |  |
| --- | --- | --- |
| **N°** | **Document name** | **Reference** |
| 1 | Traceability Matrix Template | 1 |
|  |  |  |
|  |  |  |
|  |  |  |

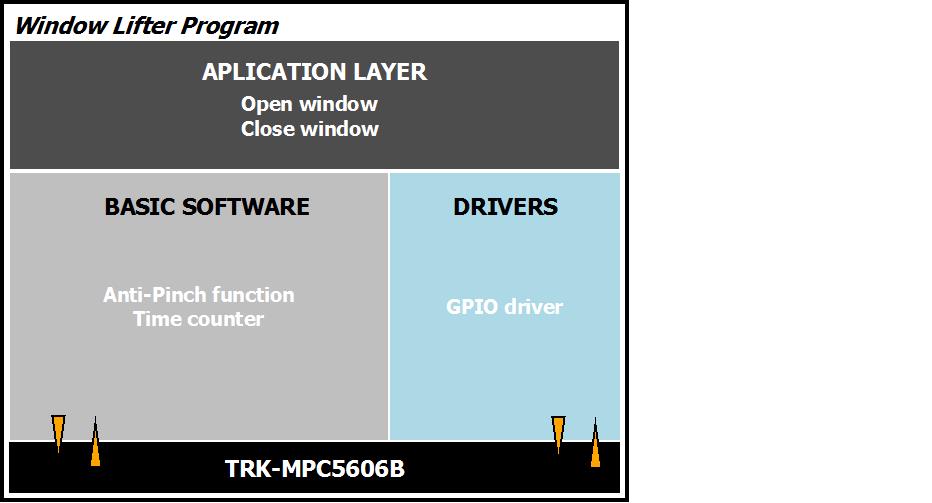
# Realization constraints and targets

The project has several functionalities to control the window, which includes the following ones:

* It will have a function that control the opening of the window.
* It will have a function that control the closure of the window.
* It will have an anti-pinch functionality, declared as interruption, which will stop the closure of the window and will open it. This functionality is for security purposes.
* When anti-pinch is active, a sub-function will disable all inputs for 5 seconds.
* When opening or closing the window there will be an indicator LED indicating the process in progress.
* There will be a function that counts how much time a button have been pressed.

# SW Conceptual design

The next diagram represents the inputs and outputs of the WINLIFT’s conceptual design and the general tasks that must be performed.

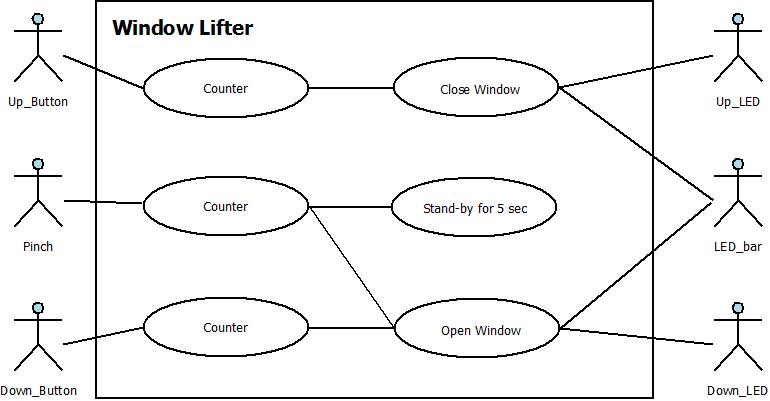


# SW Component internal breakdown

## Diagrams

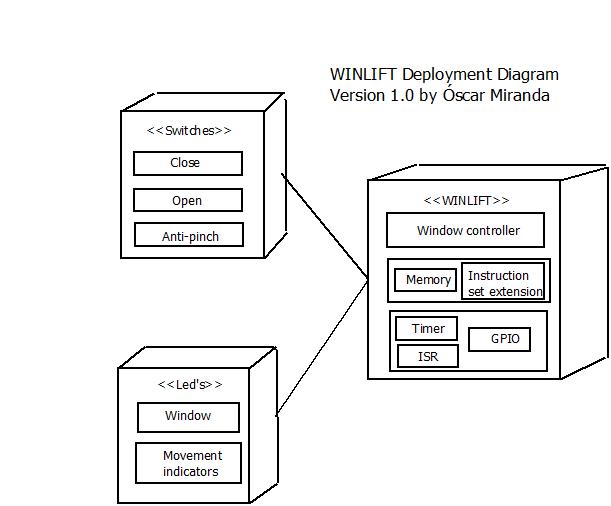
### Use Case Diagram

The following Use Case diagram describes the general interaction between the main actor and the function that will be added to the program. It describes the over-all behavior of the window lift system.



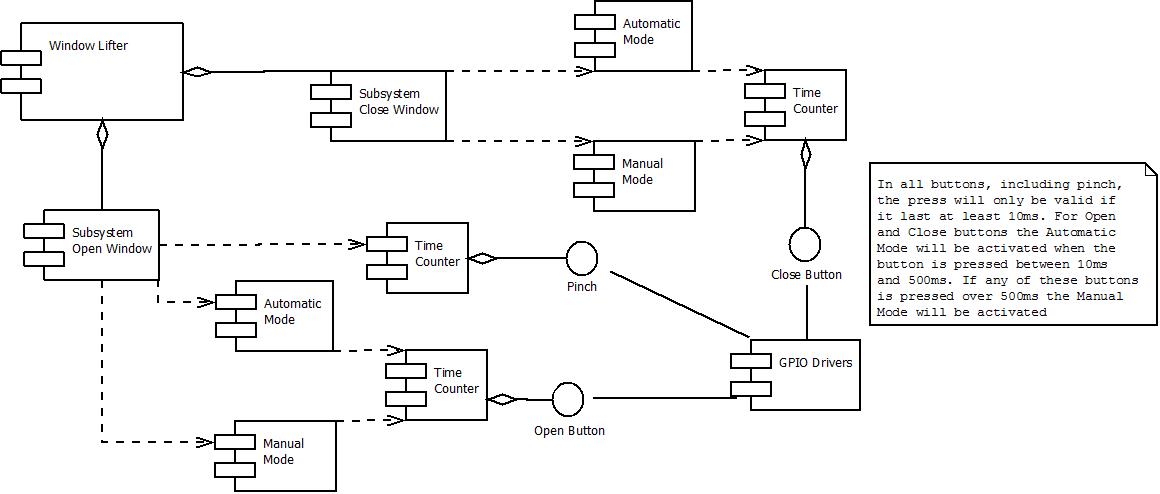
### Deployment Diagram

The following deployment diagram represents the inputs, outputs, the processing module that corresponds to the API, the HAL and the MCAL.



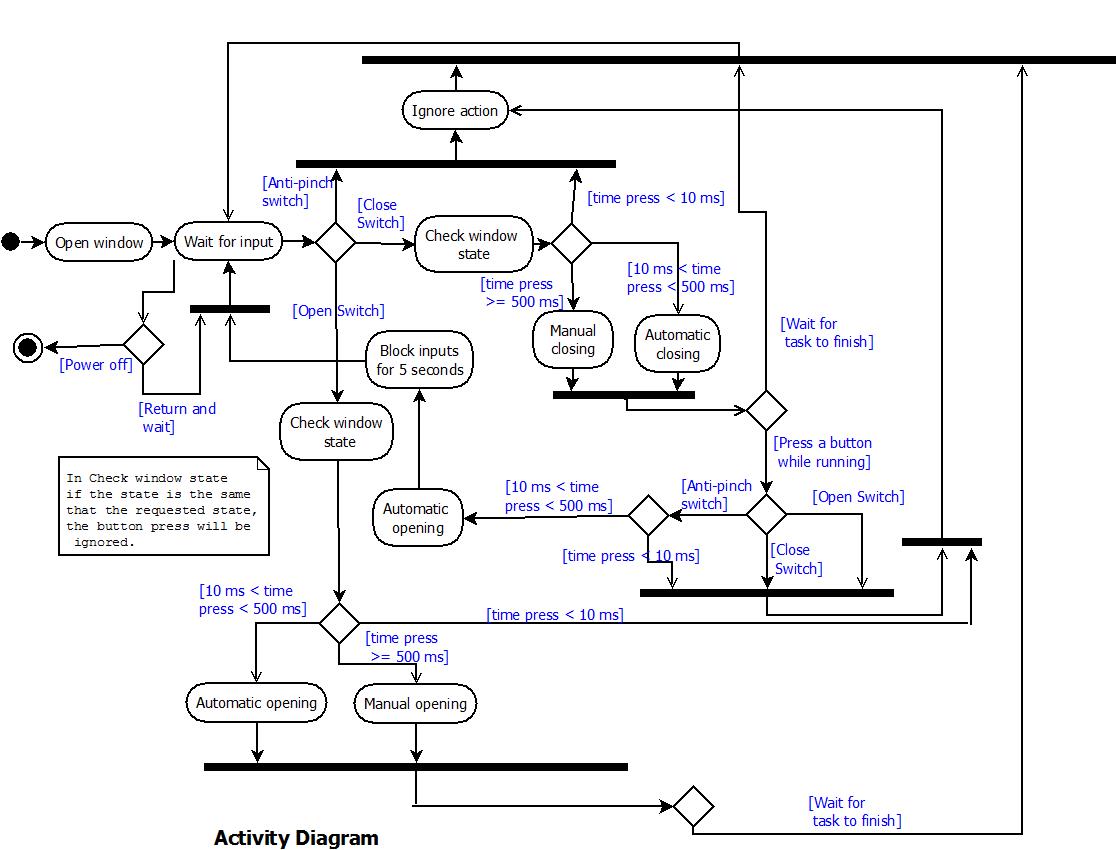
### Component Diagram

The following Component Diagram describes the structure and relations between the sub-systems comprehended in the Window Lifter system.

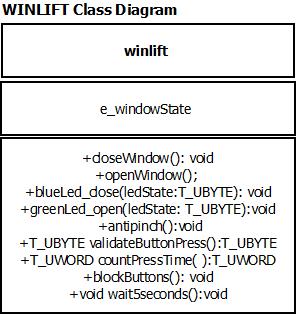


### Activity Diagram

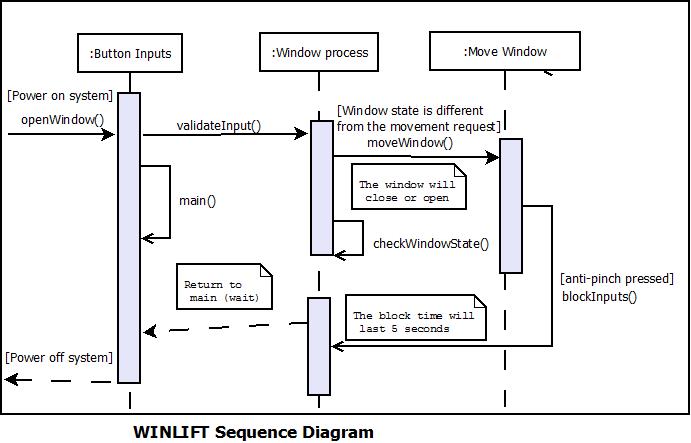
The following flowchart defines all the default and other possible states of the window, the operations like open or close window, the anti-pinch functionality, the validation of a button and the end of the program flow that is when the system is reset, or turned off.



### Class Diagram

The class represents the the API of WINLIFT. It has 9 methods and 1 attribute.

### Sequence Diagram

This diagram represents a general flow of the WINLIFT software. Note that the function moveWindow() could be a openWindow() or a closeWindow() function, and while the system is running, the most of the time, it will wait for an input, until is turn off. The initial or default state is window open.

## Functional Decomposition

Overview of functions and their dependencies shown by a Static Function Tree  
  
  


**Function Description and Dynamic Behavior**

Provide detailed static and dynamic description of all functions of the SW Component.   
Functions which are defined in other SW Components shall only be referenced in the external interface description!  
The signature description shall be done inside the function header in the source code.  
  
For each function, the following section should be copied

## ***void closeWindow( )***

|  |  |
| --- | --- |
| **Description** | Lifts the window.  This function will simulate and opening of the window by turning on, in an down-to-up transition of 400 ms, the leds. This function will call the function blueLed\_open() once to turn on the blue led, and when the window is totally open, the blueLed\_open() function must be call a final time to turn off the blue led. |
| **Return Value** | *There is no return value* |
| **Precondition** | Only can be called when the when up button is pressed |
| **Post condition** | *Leds’ transition down-to-up executes* |
| **Error Conditions** | *Not defined* |

## ***void openWindow( )***

|  |  |
| --- | --- |
| **Description** | Lowers the window.  This function will simulate and opening of the window by turning on, in an up-to-down transition of 400 ms, the leds. This function will call the function greenLed\_open() once to turn on the green led, and when the window is totally open, the greenLed\_open() function must be call a final time to turn off the blue led. |
| **Return Value** | *There is no return value* |
| **Precondition** | Only can be called when the down button is pressed |
| **Post condition** | *Leds’ transition up-to-down executes* |
| **Error Conditions** | *Not defined* |

## void blueLed\_close(*T\_UBYTE ledState* )

|  |  |
| --- | --- |
| **Description** | Turns on/off the blue Led: if ledState == 0 turns on the led, if  ledState != 0 turns off the led |
| **Parameter 1** <input| output| inout> | *T\_UBYTE ledState* |
| **Precondition** | closeWindow() called |
| **Post condition** | *Turns on/off blueLed and the state of the window is defined* |
| **Error Conditions** | *Not defined* |

## void greenLed\_open(T\_UBYTE ledState )

|  |  |
| --- | --- |
| **Description** | Turns on/off the green Led: if ledState == 0 turns on the led, if  ledState != 0 turns off the led |
| **Parameter 1** <input| output| inout> | *T\_UBYTE ledState* |
| **Precondition** | openWindow() called |
| **Post condition** | *Turns on/off green Led and the state of the window is defined* |
| **Error Conditions** | *Not defined* |

## ***void antipinch()***

|  |  |
| --- | --- |
| **Description** | Stops and lowers the window. This function will call the openWindow() task, and disable all the inputs during 5 seconds. |
| **Return Value** | *There is no return value* |
| **Precondition** | Only open button was pressed |
| **Post condition** | *Block inputs during 5 seconds* |
| **Error Conditions** | *Not defined* |

## T\_UBYTE validateButtonPress( )

|  |  |
| --- | --- |
| **Description** | It validates the time press button (time press > 10 ms)  And choose a manual or automatic action |
| **Return Value** | *There is no return value* |
| **Precondition** | A button was pressed |
| **Post condition** | *Call antiPinch(), openWindow() or closeWindow()* |
| **Error Conditions** | *Not defined* |

## T\_ULONG countPressTime( )

|  |  |
| --- | --- |
| **Description** | It counts the time of a button press  This function will count the time of a button press, the register of the button will be read and then using the timer module it’ll start to count the time until the button is released. |
| **Parameter 1** <input| output| inout> | *No parameters* |
| **Return Value** | *The elapsed time since a button was pressed until it is released* |
| **Precondition** | close, open or antipinch button must have been pressed |
| **Post condition** | *Timer is cleared* |
| **Error Conditions** | *Not defined* |

## ***void blockButtons()***

|  |  |
| --- | --- |
| **Description** | This function disable all the buttons for 5 seconds while the window is opening. When the window is totally open, all the inputs are enable. |
| **Return Value** | *There is no return value* |
| **Precondition** | A validation of anti-pinch was performed |
| **Post condition** | *Enable all the inputs* |
| **Error Conditions** | *Not defined* |

## ***void wait5seconds()***

|  |  |
| --- | --- |
| **Description** | A delay of 5 seconds |
| **Return Value** | *There is no return value* |
| **Precondition** | BlockButtons was invoked. |
| **Post condition** | *the system is waiting for another input* |
| **Error Conditions** | *Not defined* |