

Traffic Light LED

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# Chapter 1

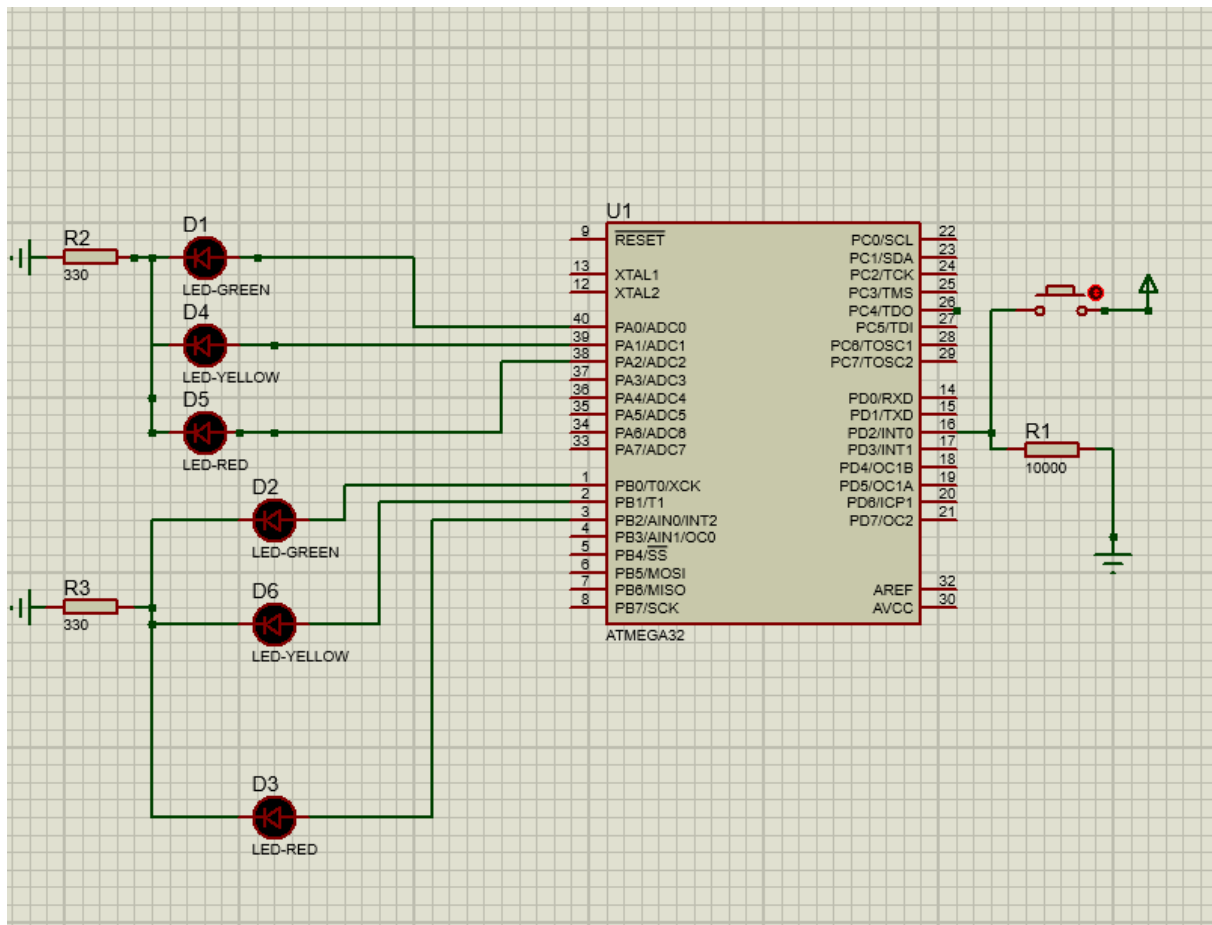
## System Design Traffic Light project

### 1.1 Introduction

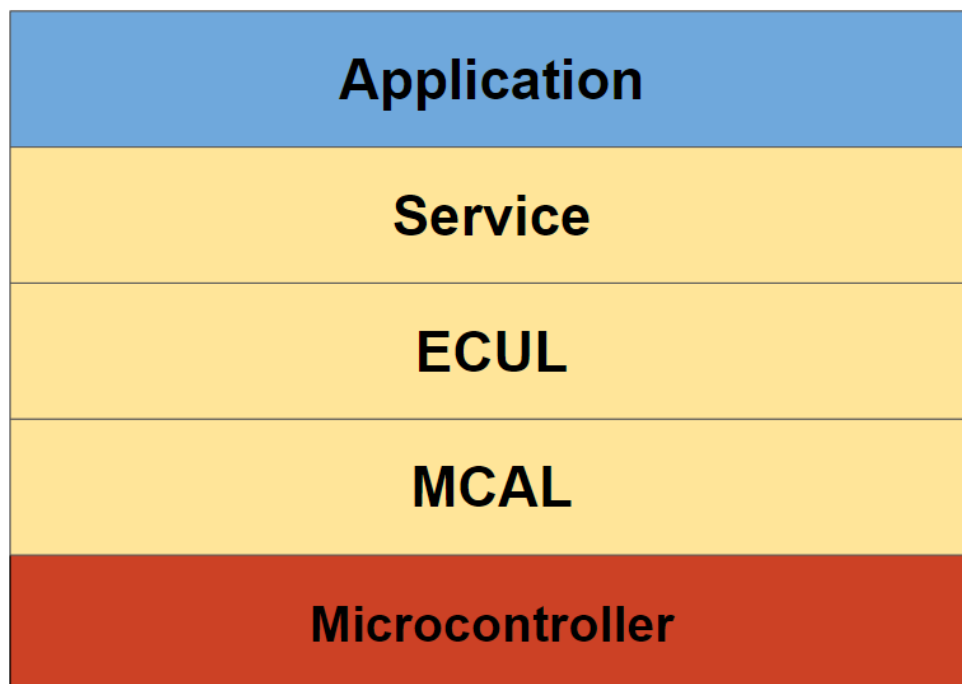
The purpose of this document is to provide the illustration of the Traffic Light project in the following:

- 1-[System Design \(proteus\)](#)
- 2-[System layers](#)
- 3-[System Drivers](#)
- 4-state machine

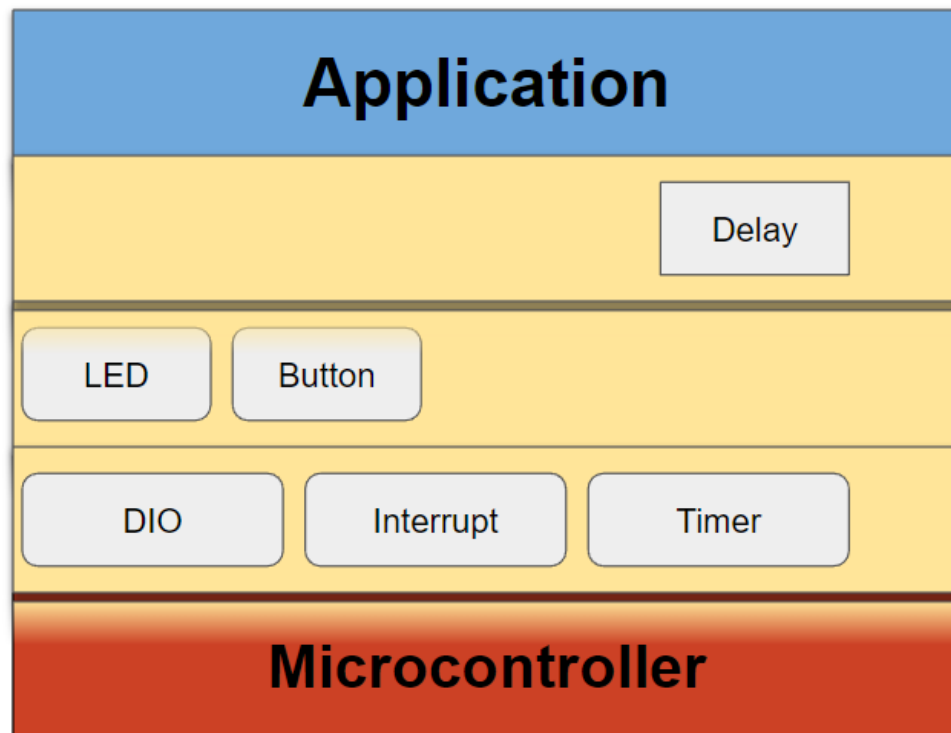
## 1.2 System Design (proteus)



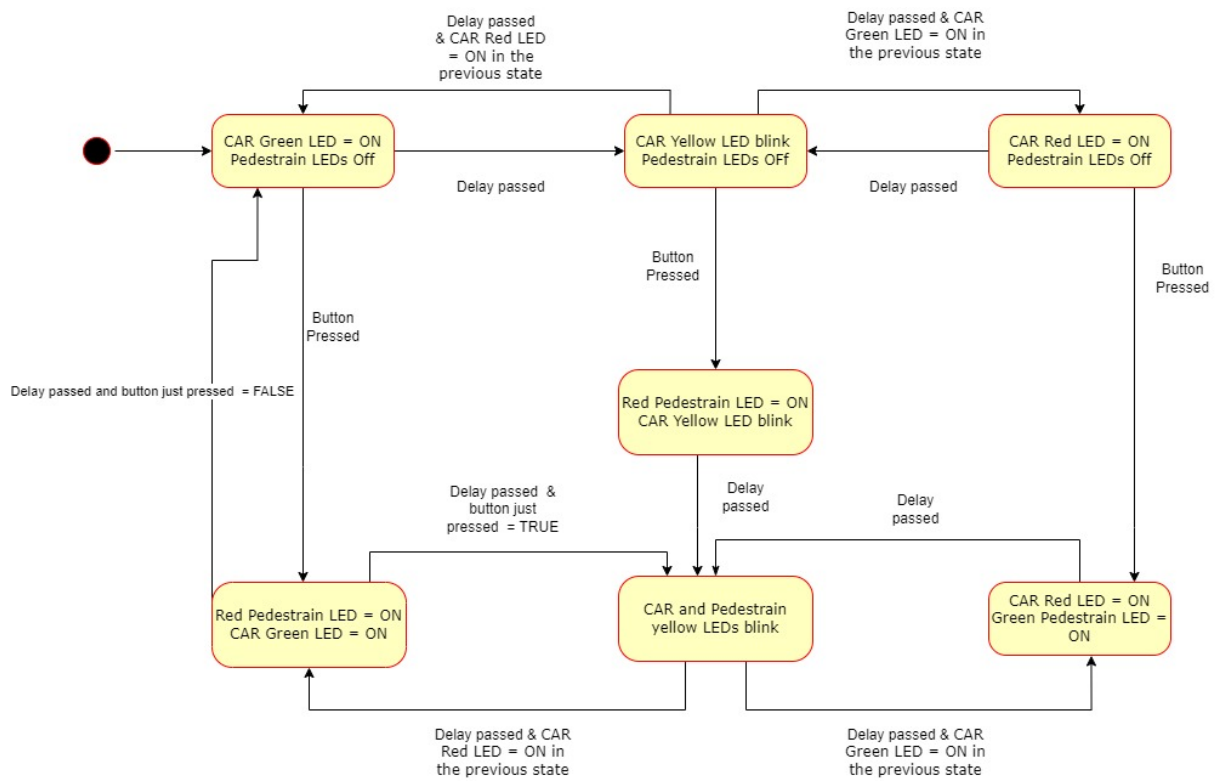
## 1.3 System layers



## 1.4 System Drivers



## 1.5 state machine







## Chapter 2

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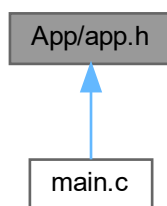
## Chapter 3

# File Documentation

### 3.1 App/app.h File Reference

Coniatsins the needed definition of the macros, variables and functions used by the application.

This graph shows which files directly or indirectly include this file:



#### Macros

- `#define ON_DELAY 5000`  
*The delay time for the LEDs.*
- `#define TOGGLE_DELAY 1000`  
*The delay used for toggling of the yellow led.*

#### Typedefs

- `typedef enum Mode Mode`  
*enum to hold in which mode the program is*
- `typedef enum LedMode LedMode`  
*enum to hold in which led state the program is*

## Enumerations

- enum `Mode` { `Normal` , `Pedestrian` }  
*enum to hold in which mode the program is*
- enum `LedMode` { `Green` , `Yellow` , `Red` , `NON` }  
*enum to hold in which led state the program is*

## Functions

- void `AppStart` ()  
*AppStart determine which mode the program is on and in return will determine the illumination of the car and pedestrian LEDs accordingly.*
- `Status LEDS_OFF` ()
- `Status Blink_CAR_YELLOW` ()  
*blink the car yellow LED for 5 seconds*
- `Status Blink_Both_YELLOW` ()  
*blink the both yellow LEDs for 5 seconds*

### 3.1.1 Detailed Description

Coniatsins the needed definition of the macros, variables and functions used by the application.

Author

Moataz

Date

September 2022

### 3.1.2 Macro Definition Documentation

#### 3.1.2.1 ON\_DELAY

```
#define ON_DELAY 5000
```

The delay time for the LEDs.

#### 3.1.2.2 TOGGLE\_DELAY

```
#define TOGGLE_DELAY 1000
```

The delay used for toggling of the yellow led.

### 3.1.3 Typedef Documentation

#### 3.1.3.1 LedMode

```
typedef enum LedMode LedMode
```

enum to hold in which led state the program is

#### 3.1.3.2 Mode

```
typedef enum Mode Mode
```

enum to hold in which mode the program is

### 3.1.4 Enumeration Type Documentation

#### 3.1.4.1 LedMode

```
enum LedMode
```

enum to hold in which led state the program is

##### Enumerator

Green	The Green led is On.
Yellow	The yellow led is blinking.
Red	The red led is on.
NON	Non of the LEDS are on.

#### 3.1.4.2 Mode

```
enum Mode
```

enum to hold in which mode the program is

##### Enumerator

Normal	The program is in Car normal mode.
Pedestrian	The program is in pedestrian mode.

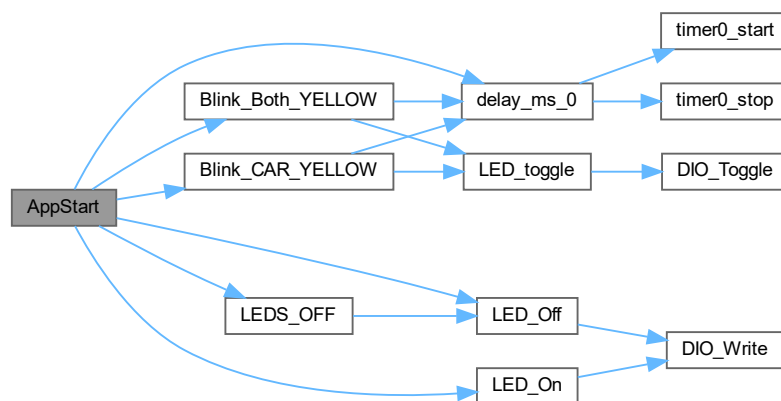
### 3.1.5 Function Documentation

#### 3.1.5.1 AppStart()

```
void AppStart ( )
```

AppStart determine which mode the program is on and in return will determine the illumination of the car and pedestrian LEDs accordingly.

Here is the call graph for this function:



Here is the caller graph for this function:



#### 3.1.5.2 Blink\_Both\_YELLOW()

```
Status Blink_Both_YELLOW ( )
```

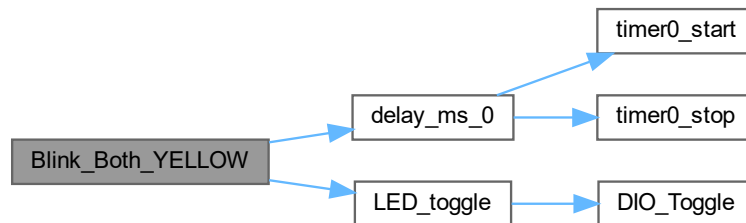
blink the both yellow LEDs for 5 seconds

calls LED toggle passing the car yellow LED parameters then delay 1 ms in a loop of 5 iterations

#### Returns

Status returns not ok if failure occurs during toggling or delay, otherwise return Ok

Here is the call graph for this function:



Here is the caller graph for this function:



#### 3.1.5.3 Blink\_CAR\_YELLOW()

```
Status Blink_CAR_YELLOW ( )
```

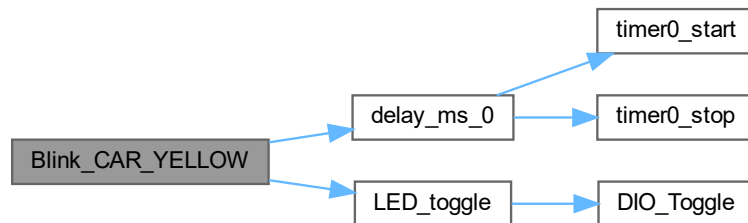
blink the car yellow LED for 5 seconds

calls LED toggle passing the car yellow LED parameters then delay 1 ms in a loop of 5 iterations

**Returns**

Status returns not ok if failure occurs during toggling or delay, otherwise return Ok

Here is the call graph for this function:



Here is the caller graph for this function:

**3.1.5.4 LEDS\_OFF()**

*Status* LEDS\_OFF ( )

**Returns**

Status

Here is the call graph for this function:





Here is the caller graph for this function:



## 3.2 app.h

[Go to the documentation of this file.](#)

```
1  /*****  
10 #ifndef APP_H_  
11 #define APP_H_  
12  
17 typedef enum Mode{  
19     Normal,  
21     Pedestrian  
22 }Mode;  
23  
28 typedef enum LedMode{  
30     Green,  
32     Yellow,  
34     Red,  
36     NON  
37 }LedMode;  
38  
40 #define ON_DELAY 5000  
42 #define TOGGLE_DELAY 1000  
43  
44 //Function Prototypes  
45 void AppStart();  
46 Status Leds_Off();  
47 Status Blink_CAR_YELLOW();  
48 Status Blink_Both_YELLOW();  
49 #endif /* APP_H_ */
```

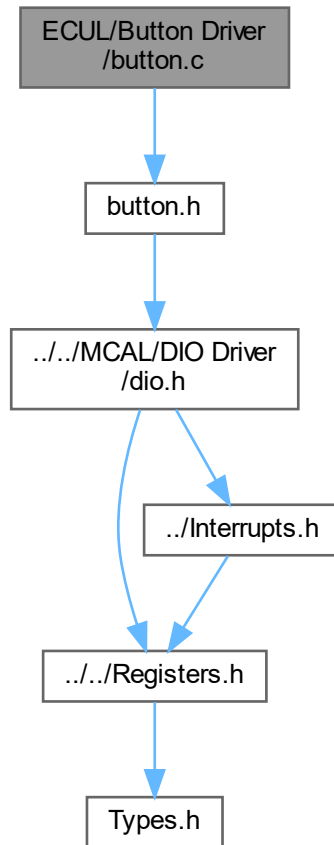
## 3.3 Doc\_pages/System Design.md File Reference

## 3.4 ECUL/Button Driver/button.c File Reference

button Driver that initialize and operates the DIO Pins as inputs connected to buttons

```
#include "button.h"
```

Include dependency graph for button.c:



## Functions

- [Status](#) `BUTTON_Init` ([uint8\\_t](#) buttonPort, [uint8\\_t](#) buttonPin)  
*Initialize DIO PIN as input.*
- [Status](#) `BUTTON_read` ([uint8\\_t](#) buttonPort, [uint8\\_t](#) buttonPin, volatile [uint8\\_t](#) \*value)  
*Reads the input coming from the button connected to the microcontroller pin.*

### 3.4.1 Detailed Description

button Driver that initialize and operates the DIO Pins as inputs connected to buttons

Author

Moataz Khaled

**Version**

0.1

**Date**

2022-09-12

**Copyright**

Copyright (c) 2022

## 3.4.2 Function Documentation

### 3.4.2.1 BUTTON\_Init()

```
Status BUTTON_Init (
    uint8_t buttonPort,
    uint8_t buttonPin )
```

Initialize DIO PIN as input.

calls the DIO\_init passing the direction value as IN to set provided pin in the port as input

**Parameters**

<i>buttonPort</i>	contains in which port the pin will be initialized as an input
<i>buttonPin</i>	contains which pin will be initialized as an input

**Returns**

Status returns Not\_Ok if the initialization fails, else returns Ok.

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.4.2.2 BUTTON\_read()

```

Status BUTTON_read (
    uint8_t buttonPort,
    uint8_t buttonPin,
    volatile uint8_t * value )
  
```

Reads the input coming from the button connected to the microcontroller pin.

calls the DIO passing the pointer value to get the status of the PIN

#### Parameters

<i>buttonPort</i>	port to be accessed (PORTA, PORTB, PORTC, PORTD)
<i>buttonPin</i>	Pin to be accessed
<i>value</i>	pointer that holds the state of the pin (high or low)

#### Returns

Status

Here is the call graph for this function:

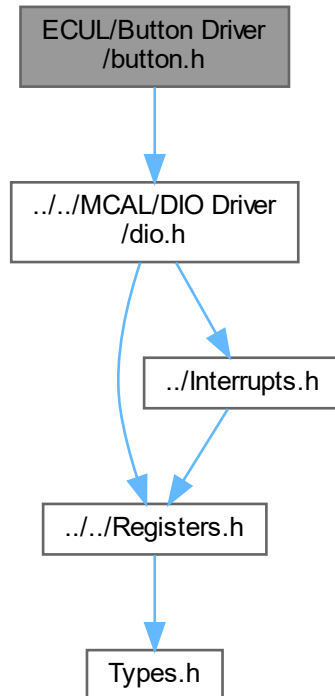


## 3.5 ECUL/Button Driver/button.h File Reference

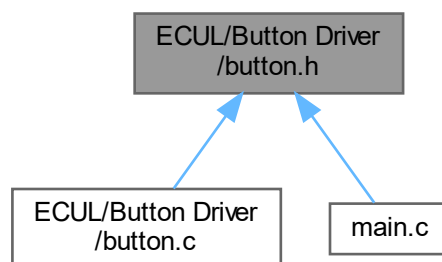
button Driver that initialize and operates the DIO Pins as inputs connected to buttons

```
#include "../../MCAL/DIO Driver/dio.h"
```

Include dependency graph for button.h:



This graph shows which files directly or indirectly include this file:



## Macros

- `#define PEDESTRIAN_BUTTON PIN2`

*Definition of the Pedestrian button to be PIN2 in PORTB.*

## Functions

- `Status BUTTON_Init (uint8_t buttonPort, uint8_t buttonPin)`  
*Initialize DIO PIN as input.*
- `Status BUTTON_read (uint8_t buttonPort, uint8_t buttonPin, volatile uint8_t *value)`  
*Reads the input coming from the button connected to the microcontroller pin.*

### 3.5.1 Detailed Description

button Driver that initialize and operates the DIO Pins as inputs connected to buttons

#### Author

Moataz Khaled

#### Version

0.1

#### Date

2022-09-12

#### Copyright

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### 3.5.2 Macro Definition Documentation

#### 3.5.2.1 PEDESTRIAN\_BUTTON

```
#define PEDESTRIAN_BUTTON PIN2
```

Definition of the Pedestrian button to be PIN2 in PORTB.

### 3.5.3 Function Documentation

#### 3.5.3.1 BUTTON\_Init()

```
Status BUTTON_Init (  
    uint8_t buttonPort,  
    uint8_t buttonPin )
```

Initialize DIO PIN as input.

calls the DIO\_init passing the direction value as IN to set provided pin in the port as input

## Parameters

<i>buttonPort</i>	contains in which port the pin will be initialized as an input
<i>buttonPin</i>	contains which pin will be initialized as an input

## Returns

Status returns Not\_Ok if the initialization fails, ekse returns Ok.

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.5.3.2 BUTTON\_read()

```
Status BUTTON_read (  
    uint8_t buttonPort,  
    uint8_t buttonPin,  
    volatile uint8_t * value )
```

Reads the input coming from the button connected to the microcontroller pin.

calls the DIO passing the pointer value to get the status of the PIN

## Parameters

<i>buttonPort</i>	port to be accessed (PORTA, PORTB, PORTC, PORTD)
<i>buttonPin</i>	Pin to be accessed
<i>value</i>	pointer that holds the state of the pin (high or low)

## Returns

Status

Here is the call graph for this function:



## 3.6 button.h

[Go to the documentation of this file.](#)

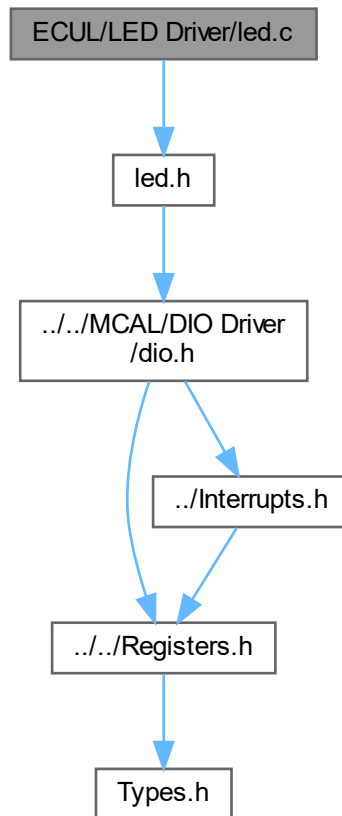
```
1
13 #ifndef BUTTON_H_
14 #define BUTTON_H_
15
16 //includes
17 #include "../../MCAL/DIO Driver/dio.h"
18
19 //Defines
20
22 #define PEDESTRIAN_BUTTON    PIN2
23
24
25 //function prototypes
26 Status BUTTON_Init(uint8_t buttonPort, uint8_t buttonPin);
27 Status BUTTON_read(uint8_t buttonPort, uint8_t buttonPin, volatile uint8_t *value);
28
29
30 #endif /* INCFILE1_H_ */
```



## 3.7 ECUL/LED Driver/led.c File Reference

```
#include "led.h"
```

Include dependency graph for led.c:



### Functions

- [Status LED\\_Init](#) ([uint8\\_t](#) ledPort, [uint8\\_t](#) ledPin)  
*Initialize the LED PIN.*
- [Status LED\\_On](#) ([uint8\\_t](#) ledPort, [uint8\\_t](#) ledPin)  
*Turns LED on.*
- [Status LED\\_Off](#) ([uint8\\_t](#) ledPort, [uint8\\_t](#) ledPin)  
*Turns LED Off.*
- [Status LED\\_toggle](#) ([uint8\\_t](#) ledPort, [uint8\\_t](#) ledPin)  
*Toggle the status of the LED.*

### 3.7.1 Detailed Description

**Author**

Moataz Khaled

**Version**

0.1

**Date**

2022-09-12

**Copyright**

Copyright (c) 2022

### 3.7.2 Function Documentation

#### 3.7.2.1 LED\_Init()

```
Status LED_Init (
    uint8_t ledPort,
    uint8_t ledPin )
```

Initialize the LED PIN.

Calls DIO\_Init with specific port and pin with OUT direction

**Parameters**

<i>ledPort</i>	Port containing the PIN that will be set as output
<i>ledPin</i>	PIN to be set as output

**See also**[DIO\\_init\(\)](#)

**Returns**

Status NOT\_OK if initialization failed, return OK otherwise

Here is the call graph for this function:



Here is the caller graph for this function:

**3.7.2.2 LED\_Off()**

```
Status LED_Off (
    uint8_t ledPort,
    uint8_t ledPin )
```

Turns LED Off.

Calls DIO\_Write with specific port and pin to set the pin to LOW

**Parameters**

<i>ledPort</i>	Port containing the PIN that will be set to low
<i>ledPin</i>	PIN to be set as output

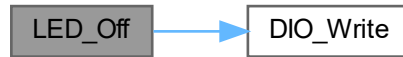
**See also**

[DIO\\_Write\(\)](#)

**Returns**

Status return if turning off the LED fails, return OK otherwise

Here is the call graph for this function:



Here is the caller graph for this function:

**3.7.2.3 LED\_On()**

```

Status LED_On (
    uint8_t ledPort,
    uint8_t ledPin )
  
```

Turns LED on.

Calls `DIO_Write` with specific port and pin to set the pin to high

**Parameters**

<i>ledPort</i>	Port containing the PIN that will be set to HIGH
<i>ledPin</i>	PIN to be set as output

**See also**

[DIO\\_Write\(\)](#)

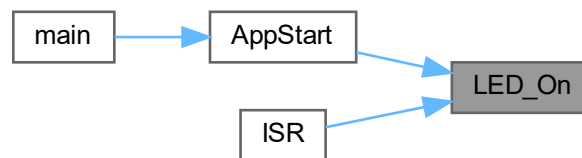
**Returns**

Status return if turning on the LED fails, return OK otherwise

Here is the call graph for this function:



Here is the caller graph for this function:

**3.7.2.4 LED\_toggle()**

```
Status LED_toggle (  
    uint8_t ledPort,  
    uint8_t ledPin )
```

Toggle the status of the LED.

Calls DIO\_Toggle with specific port and pin to flip the status of the pin

**Parameters**

<i>ledPort</i>	Port containing the PIN that will be flipped
<i>ledPin</i>	PIN to be set as output

**See also**

[DIO\\_Toggle\(\)](#)

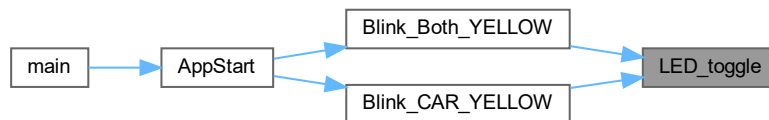
#### Returns

Status return if toggling the LED fails, return OK otherwise

Here is the call graph for this function:



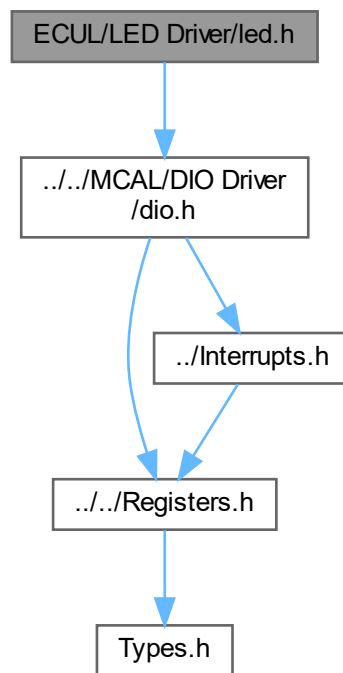
Here is the caller graph for this function:



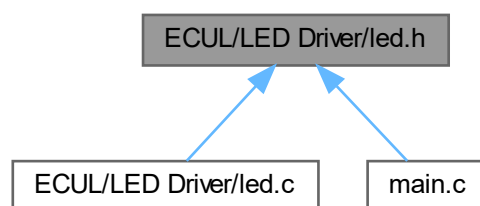
## 3.8 ECUL/LED Driver/led.h File Reference

```
#include "../MCAL/DIO Driver/dio.h"
```

Include dependency graph for led.h:



This graph shows which files directly or indirectly include this file:



## Macros

- `#define CAR_LED_GREEN PIN0`
- `#define CAR_LED_YELLOW PIN1`
- `#define CAR_LED_RED PIN2`
- `#define PEDES_LED_GREEN PIN0`
- `#define PEDES_LED_YELLOW PIN1`
- `#define PEDES_LED_RED PIN2`

## Functions

- [Status LED\\_Init](#) ([uint8\\_t](#) ledPort, [uint8\\_t](#) ledPin)  
*Initialize the LED PIN.*
- [Status LED\\_On](#) ([uint8\\_t](#) ledPort, [uint8\\_t](#) ledPin)  
*Turns LED on.*
- [Status LED\\_Off](#) ([uint8\\_t](#) ledPort, [uint8\\_t](#) ledPin)  
*Turns LED Off.*
- [Status LED\\_toggle](#) ([uint8\\_t](#) ledPort, [uint8\\_t](#) ledPin)  
*Toggle the status of the LED.*

### 3.8.1 Detailed Description

#### Author

Moataz Khaled

#### Version

0.1

#### Date

2022-09-12

#### Copyright

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### 3.8.2 Macro Definition Documentation

#### 3.8.2.1 CAR\_LED\_GREEN

```
#define CAR_LED_GREEN PIN0
```

#### 3.8.2.2 CAR\_LED\_RED

```
#define CAR_LED_RED PIN2
```



### 3.8.2.3 CAR\_LED\_YELLOW

```
#define CAR_LED_YELLOW PIN1
```

### 3.8.2.4 PEDES\_LED\_GREEN

```
#define PEDES_LED_GREEN PIN0
```

### 3.8.2.5 PEDES\_LED\_RED

```
#define PEDES_LED_RED PIN2
```

### 3.8.2.6 PEDES\_LED\_YELLOW

```
#define PEDES_LED_YELLOW PIN1
```

## 3.8.3 Function Documentation

### 3.8.3.1 LED\_Init()

```
Status LED_Init (
    uint8_t ledPort,
    uint8_t ledPin )
```

Initialize the LED PIN.

Calls DIO\_Init with specific port and pin with OUT direction

#### Parameters

<i>ledPort</i>	Port containing the PIN that will be set as output
<i>ledPin</i>	PIN to be set as output

#### See also

[DIO\\_init\(\)](#)

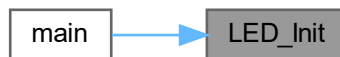
**Returns**

Status NOT\_OK if initialization failed, return OK otherwise

Here is the call graph for this function:



Here is the caller graph for this function:

**3.8.3.2 LED\_Off()**

```
Status LED_Off (
    uint8_t ledPort,
    uint8_t ledPin )
```

Turns LED Off.

Calls DIO\_Write with specific port and pin to set the pin to LOW

**Parameters**

<i>ledPort</i>	Port containing the PIN that will be set to low
<i>ledPin</i>	PIN to be set as output

**See also**

[DIO\\_Write\(\)](#)

#### Returns

Status return if turning off the LED fails, return OK otherwise

Here is the call graph for this function:



Here is the caller graph for this function:



#### 3.8.3.3 LED\_On()

```
Status LED_On (  
    uint8_t ledPort,  
    uint8_t ledPin )
```

Turns LED on.

Calls `DIO_Write` with specific port and pin to set the pin to high

#### Parameters

<i>ledPort</i>	Port containing the PIN that will be set to HIGH
<i>ledPin</i>	PIN to be set as output

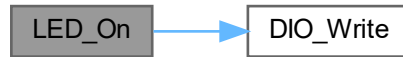
#### See also

[DIO\\_Write\(\)](#)

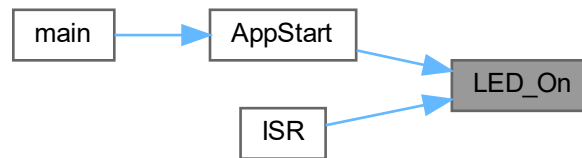
**Returns**

Status return if turning on the LED fails, return OK otherwise

Here is the call graph for this function:



Here is the caller graph for this function:

**3.8.3.4 LED\_toggle()**

```
Status LED_toggle (  
    uint8_t ledPort,  
    uint8_t ledPin )
```

Toggle the status of the LED.

Calls DIO\_Toggle with specific port and pin to flip the status of the pin

**Parameters**

<i>ledPort</i>	Port containing the PIN that will be flipped
<i>ledPin</i>	PIN to be set as output

**See also**

[DIO\\_Toggle\(\)](#)

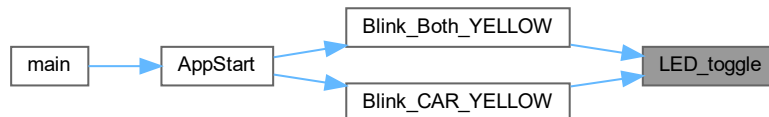
**Returns**

Status return if toggling the LED fails, return OK otherwise

Here is the call graph for this function:



Here is the caller graph for this function:



## 3.9 led.h

[Go to the documentation of this file.](#)

```

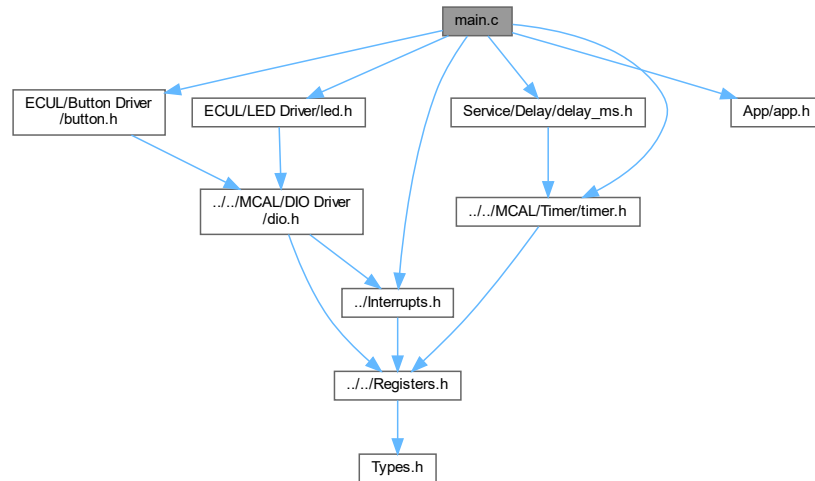
1
12 #ifndef LED_H_
13 #define LED_H_
14
15 #include "../MCAL/DIO Driver/dio.h"
16
17
18 #define CAR_LED_GREEN      PIN0
19 #define CAR_LED_YELLOW    PIN1
20 #define CAR_LED_RED       PIN2
21
22 #define PEDES_LED_GREEN   PIN0
23 #define PEDES_LED_YELLOW  PIN1
24 #define PEDES_LED_RED    PIN2
25
26 Status LED_Init(uint8_t ledPort, uint8_t ledPin);
27 Status LED_On(uint8_t ledPort, uint8_t ledPin);
28 Status LED_Off(uint8_t ledPort, uint8_t ledPin);
29 Status LED_toggle(uint8_t ledPort, uint8_t ledPin);
30
31
32
33
34 #endif /* LED_H_ */
  
```

## 3.10 main.c File Reference

the application main function and App\_start function

```
#include "ECUL/Button Driver/button.h"
#include "ECUL/LED Driver/led.h"
#include "Service/Delay/delay_ms.h"
#include "MCAL/Timer/timer.h"
#include "MCAL/Interrupts.h"
#include "App/app.h"
```

Include dependency graph for main.c:



## Macros

- `#define F_CPU 1000000U`  
*Clock frequency.*

## Functions

- `int main (void)`  
*Program main function.*
- `void AppStart ()`  
*AppStart determine which mode the program is on and in return will determine the illumination of the car and pedestrian LEDs accordingly.*
- `Status LEDS_OFF ()`
- `Status Blink_CAR_YELLOW ()`  
*blink the car yellow LED for 5 seconds*
- `Status Blink_Both_YELLOW ()`  
*blink the both yellow LEDs for 5 seconds*
- `ISR (EXT_INT_0)`  
*ISR will shift the state from Normal to Pedestrian Upon button press.*

## Variables

- `Mode currentMode = Normal`  
*The state of the program.*
- `LedMode current_carLed_Mode = Green`  
*The variable holds the currently illuminated LED.*
- `LedMode previous_carLed_Mode = Green`  
*The variable holds the previously illuminated LED.*
- `uint8_t Flag = FALSE`  
*The flag which determine if the interrupt is fired or not.*
- `LedMode FirstState`  
*The variable shows which LED was illuminated when the interrupt was fired.*
- `Status App_state`  
*holds the status of the running application*

### 3.10.1 Detailed Description

the application main function and App\_start function

#### Author

Moataz

#### Date

September 2022

### 3.10.2 Macro Definition Documentation

#### 3.10.2.1 F\_CPU

```
#define F_CPU 1000000U
```

Clock frequency.

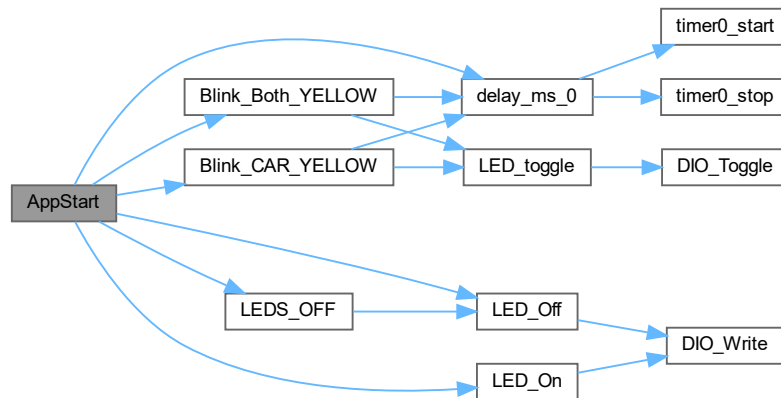
### 3.10.3 Function Documentation

### 3.10.3.1 AppStart()

```
void AppStart ( )
```

AppStart determine which mode the program is on and in return will determine the illumination of the car and pedestrian LEDs accordingly.

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.10.3.2 Blink\_Both\_YELLOW()

```
Status Blink_Both_YELLOW ( )
```

blink the both yellow LEDs for 5 seconds

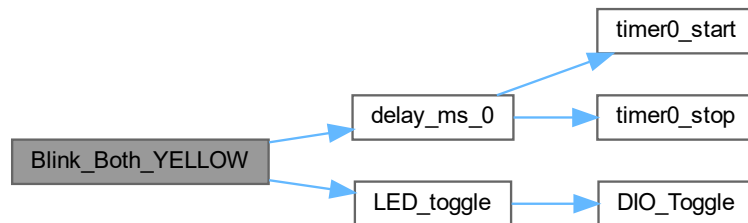
calls LED toggle passing the car yellow LED parameters then delay 1 ms in a loop of 5 iterations



### Returns

Status returns not ok if failure occurs during toggling or delay, otherwise return Ok

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.10.3.3 Blink\_CAR\_YELLOW()

```
Status Blink_CAR_YELLOW ( )
```

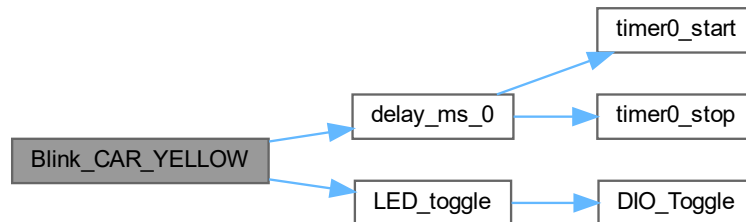
blink the car yellow LED for 5 seconds

calls LED toggle passing the car yellow LED parameters then delay 1 ms in a loop of 5 iterations

**Returns**

Status returns not ok if failure occurs during toggling or delay, otherwise return Ok

Here is the call graph for this function:



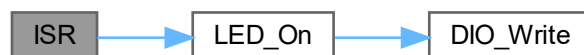
Here is the caller graph for this function:

**3.10.3.4 ISR()**

```
ISR (
    EXT_INT_0
)
```

ISR will shift the state from Normal to Pedestrian Upon button press.

the ISR will be fired with the button is pressed Here is the call graph for this function:



### 3.10.3.5 LEDS\_OFF()

```
Status LEDS_OFF ( )
```

#### Returns

Status

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.10.3.6 main()

```
int main (
    void )
```

Program main function.

Initializers the needed drivers for the application calls the Appstart to start the application

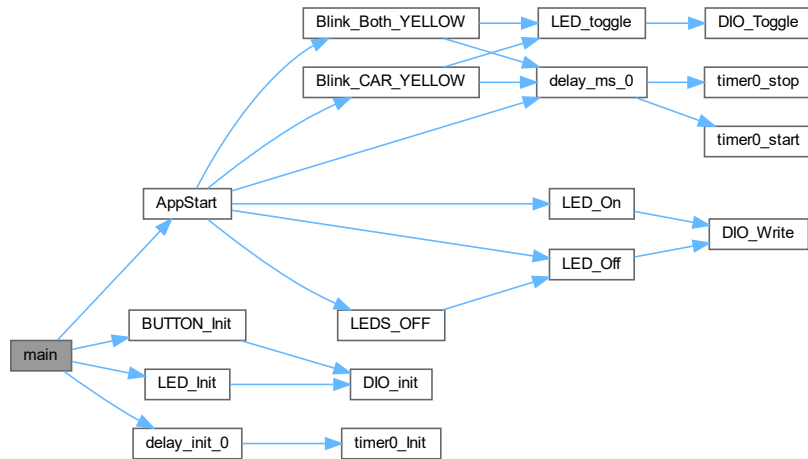
#### See also

[LED\\_Init\(\)](#) [BUTTON\\_Init\(\)](#) [delay\\_init\\_0\(\)](#) [AppStart\(\)](#)

## Returns

int 0 if the programs has no errors,

Here is the call graph for this function:



## 3.10.4 Variable Documentation

### 3.10.4.1 App\_state

`Status` `App_state`

holds the status of the running application

### 3.10.4.2 current\_carLed\_Mode

`LedMode` `current_carLed_Mode` = `Green`

The variable holds the currently illuminated LED.

### 3.10.4.3 currentMode

`Mode` `currentMode` = `Normal`

The state of the program.

#### 3.10.4.4 FirstState

```
LedMode FirstState
```

The variable shows which LED was illuminated when the interrupt was fired.

#### 3.10.4.5 Flag

```
uint8_t Flag = FALSE
```

The flag which determine if the interrupt is fired or not.

#### 3.10.4.6 previous\_carLed\_Mode

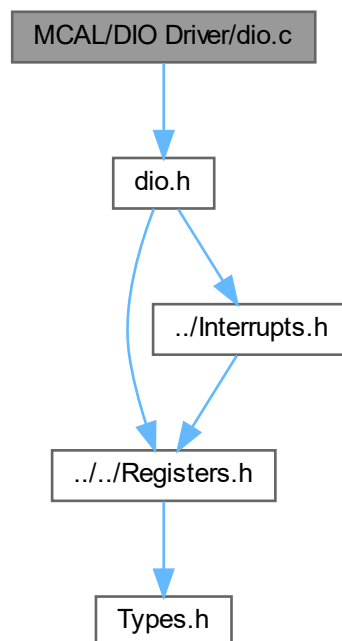
```
LedMode previous_carLed_Mode = Green
```

The variable holds the previously illuminated LED.

### 3.11 MCAL/DIO Driver/dio.c File Reference

```
#include "dio.h"
```

Include dependency graph for dio.c:



## Functions

- `Status DIO_init (uint8_t pinNumber, uint8_t portNumber, uint8_t direction)`  
*Initialize the pin of the port with the required direction.*
- `Status DIO_Write (uint8_t pinNumber, uint8_t portNumber, uint8_t value)`  
*write a value in the pin*
- `Status DIO_Toggle (uint8_t pinNumber, uint8_t portNumber)`  
*Toggle the value of the output pin.*
- `Status DIO_Read (uint8_t pinNumber, uint8_t portNumber, uint8_t *value)`  
*Read the value of a certain PIN.*

### 3.11.1 Detailed Description

#### Author

Moataz Khaled

#### Version

0.1

#### Date

2022-09-12

#### Copyright

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### 3.11.2 Function Documentation

#### 3.11.2.1 DIO\_init()

```
Status DIO_init (  
    uint8_t pinNumber,  
    uint8_t portNumber,  
    uint8_t direction )
```

Initialize the pin of the port with the required direction.

initialize a pin in a certain port with the direction

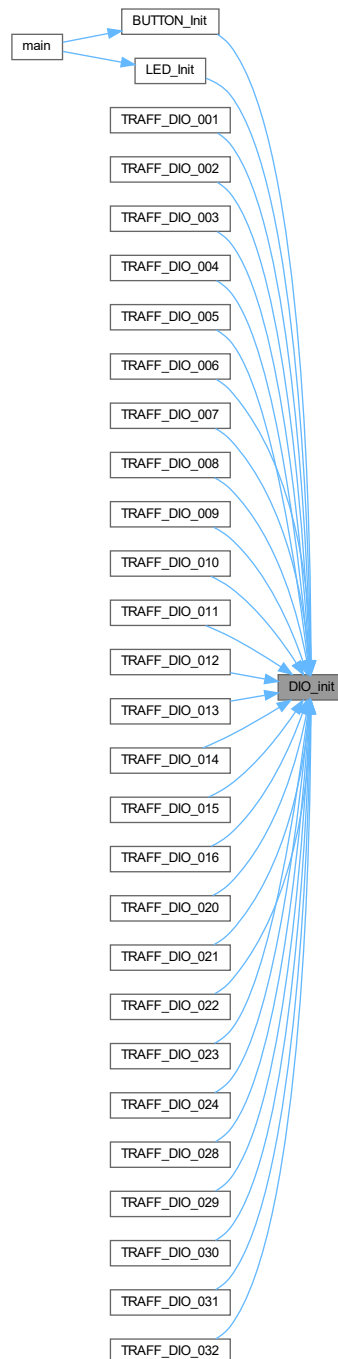
#### Parameters

<i>pinNumber</i>	PIN that will be set
<i>portNumber</i>	Port containing the PIN that will be set
<i>direction</i>	(IN/OUT)

### Returns

Status return Not\_Ok if the passed port is not in range (A->D) or pin number > 7

Here is the caller graph for this function:



### 3.11.2.2 DIO\_Read()

```
Status DIO_Read (
    uint8_t pinNumber,
    uint8_t portNumber,
    uint8_t * value )
```

Read the value of a certain PIN.

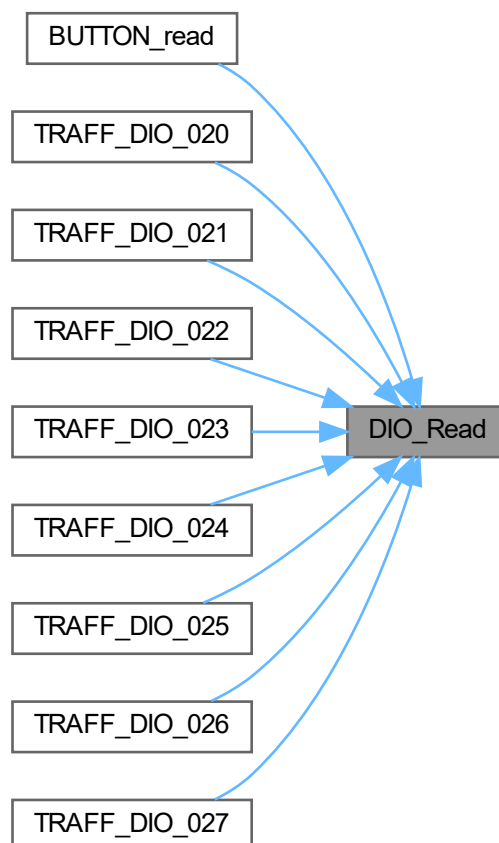
#### Parameters

<i>pinNumber</i>	PIN that will be read
<i>portNumber</i>	Port containing the PIN that will be read
<i>value</i>	pointer holds the state of the PIN (HIGH or LOW)

#### Returns

Status return Not\_Ok if the passed pin direction is in not set as input or pin number > 7, otherwise return Ok

Here is the caller graph for this function:





### 3.11.2.3 DIO\_Toggle()

```
Status DIO_Toggle (
    uint8_t pinNumber,
    uint8_t portNumber )
```

Toggle the value of the output pin.

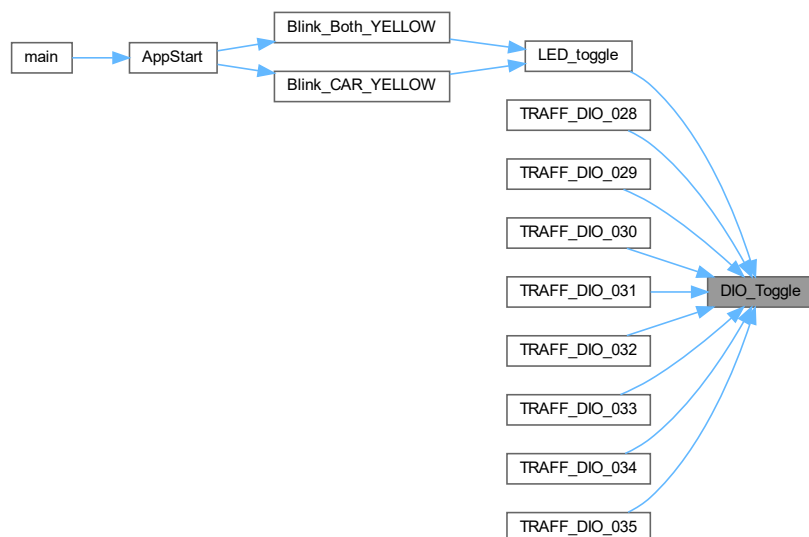
#### Parameters

<i>pinNumber</i>	PIN that will be toggled
<i>portNumber</i>	Port containing the PIN that will be toggled

#### Returns

Status return Not\_Ok if the passed pin direction is in not set as output or pin number > 7, otherwise return Ok

Here is the caller graph for this function:



### 3.11.2.4 DIO\_Write()

```
Status DIO_Write (
    uint8_t pinNumber,
    uint8_t portNumber,
    uint8_t value )
```

write a value in the pin

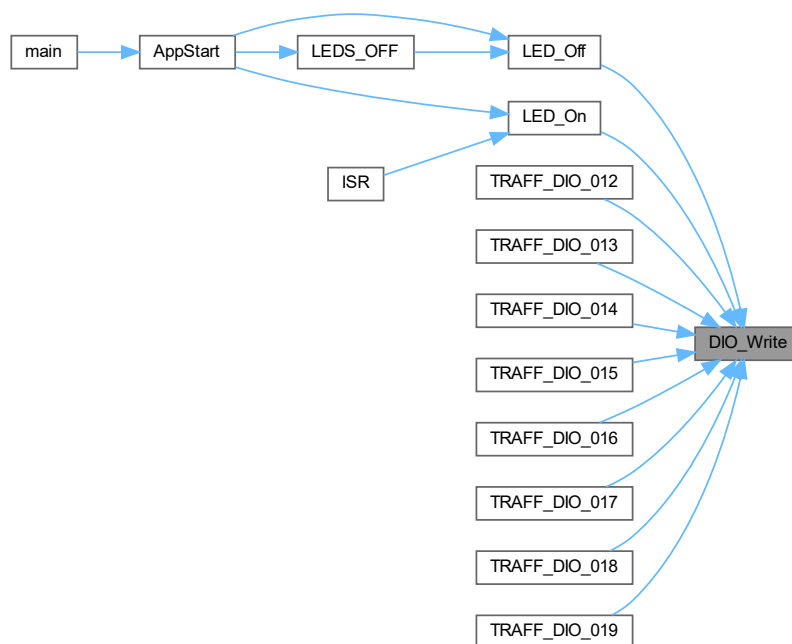
**Parameters**

<i>pinNumber</i>	PIN that will be set
<i>portNumber</i>	Port containing the PIN that will be set
<i>value</i>	(HIGH/LOW)

**Returns**

Status return Not\_Ok if the passed pin direction is in not set as output or pin number > 7, otherwise return Ok

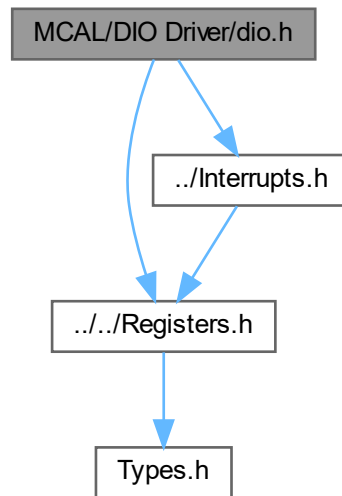
Here is the caller graph for this function:



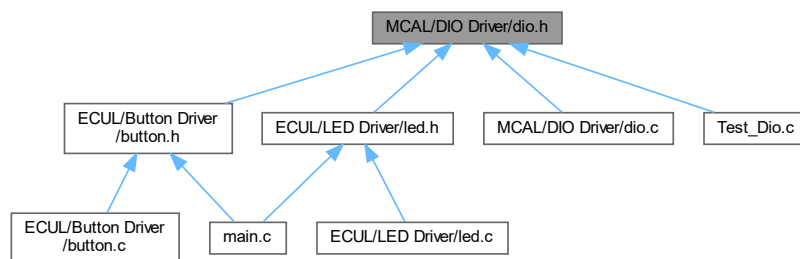
## 3.12 MCAL/DIO Driver/dio.h File Reference

```
#include "../Registers.h"
#include "../Interrupts.h"
```

Include dependency graph for dio.h:



This graph shows which files directly or indirectly include this file:



## Macros

- `#define Port_A 'A'`
- `#define Port_B 'B'`
- `#define Port_C 'C'`
- `#define Port_D 'D'`
- `#define IN 0`
- `#define OUT 1`
- `#define LOW 0`
- `#define HIGH 1`

## Functions

- [Status DIO\\_init](#) ([uint8\\_t](#) pinNumber, [uint8\\_t](#) portNumber, [uint8\\_t](#) direction)  
*Initialize the pin of the port with the required direction.*
- [Status DIO\\_Write](#) ([uint8\\_t](#) pinNumber, [uint8\\_t](#) portNumber, [uint8\\_t](#) value)  
*write a value in the pin*
- [Status DIO\\_Toggle](#) ([uint8\\_t](#) pinNumber, [uint8\\_t](#) portNumber)  
*Toggle the value of the output pin.*
- [Status DIO\\_Read](#) ([uint8\\_t](#) pinNumber, [uint8\\_t](#) portNumber, [uint8\\_t](#) \*value)  
*Read the value of a certain PIN.*

### 3.12.1 Macro Definition Documentation

#### 3.12.1.1 HIGH

```
#define HIGH 1
```

#### 3.12.1.2 IN

```
#define IN 0
```

#### 3.12.1.3 LOW

```
#define LOW 0
```

#### 3.12.1.4 OUT

```
#define OUT 1
```

#### 3.12.1.5 Port\_A

```
#define Port_A 'A'
```

### 3.12.1.6 Port\_B

```
#define Port_B 'B'
```

### 3.12.1.7 Port\_C

```
#define Port_C 'C'
```

### 3.12.1.8 Port\_D

```
#define Port_D 'D'
```

## 3.12.2 Function Documentation

### 3.12.2.1 DIO\_init()

```
Status DIO_init (
    uint8_t pinNumber,
    uint8_t portNumber,
    uint8_t direction )
```

Initialize the pin of the port with the required direction.

initialize a pin in a certain port with the direction

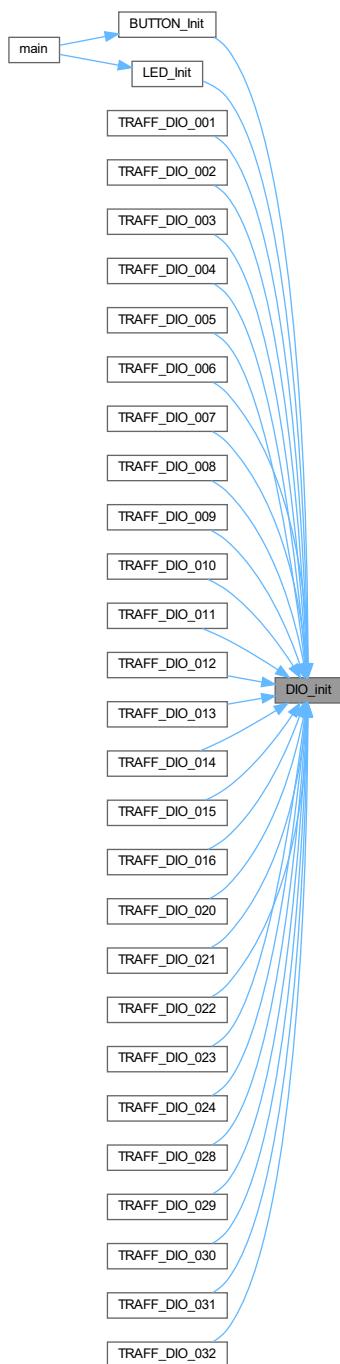
#### Parameters

<i>pinNumber</i>	PIN that will be set
<i>portNumber</i>	Port containing the PIN that will be set
<i>direction</i>	(IN/OUT)

### Returns

Status return Not\_Ok if the passed port is not in range (A->D) or pin number > 7

Here is the caller graph for this function:



### 3.12.2.2 DIO\_Read()

```
Status DIO_Read (
    uint8_t pinNumber,
    uint8_t portNumber,
    uint8_t * value )
```

Read the value of a certain PIN.

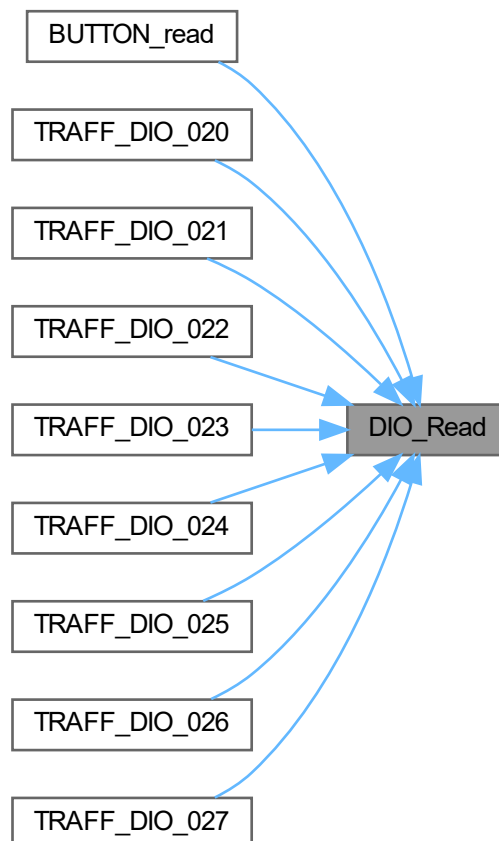
#### Parameters

<i>pinNumber</i>	PIN that will be read
<i>portNumber</i>	Port containing the PIN that will be read
<i>value</i>	pointer holds the state of the PIN (HIGH or LOW)

#### Returns

Status return Not\_Ok if the passed pin direction is in not set as input or pin number > 7, otherwise return Ok

Here is the caller graph for this function:



### 3.12.2.3 DIO\_Toggle()

```
Status DIO_Toggle (
    uint8_t pinNumber,
    uint8_t portNumber )
```

Toggle the value of the output pin.

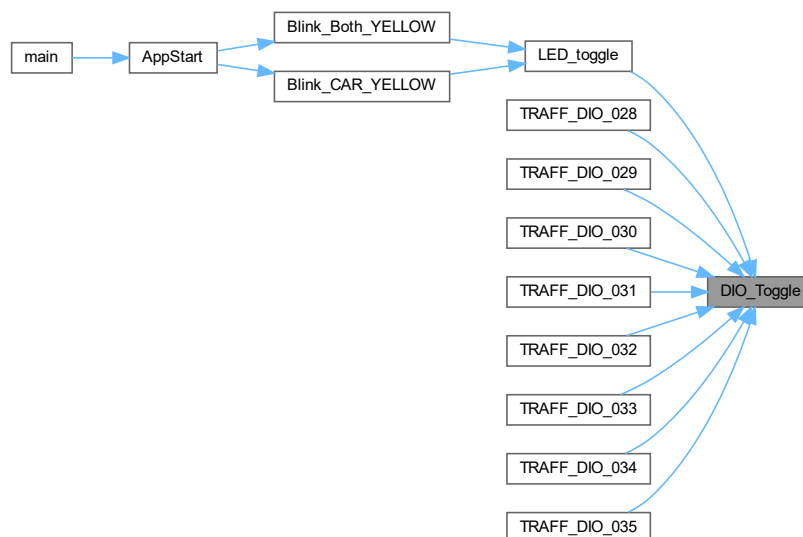
#### Parameters

<i>pinNumber</i>	PIN that will be toggled
<i>portNumber</i>	Port containing the PIN that will be toggled

#### Returns

Status return Not\_Ok if the passed pin direction is in not set as output or pin number > 7, otherwise return Ok

Here is the caller graph for this function:



### 3.12.2.4 DIO\_Write()

```
Status DIO_Write (
    uint8_t pinNumber,
    uint8_t portNumber,
    uint8_t value )
```

write a value in the pin



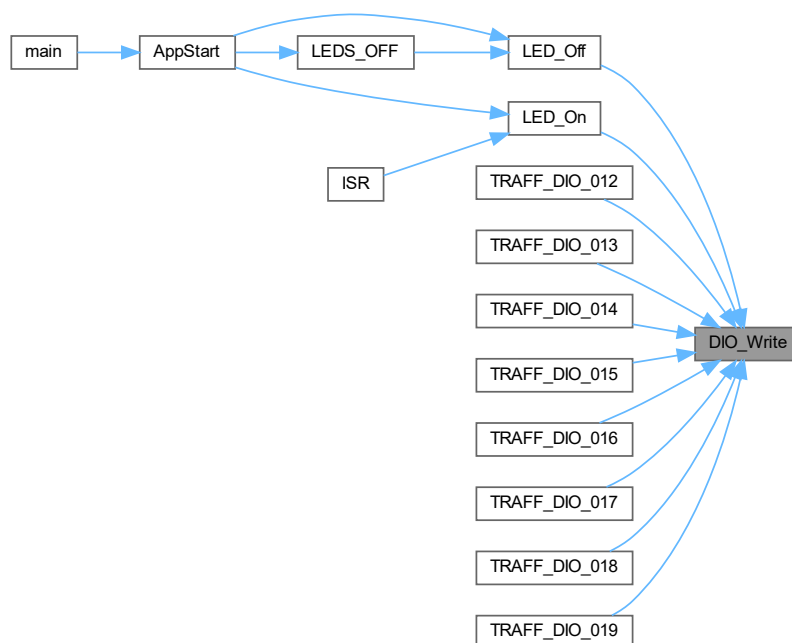
## Parameters

<i>pinNumber</i>	PIN that will be set
<i>portNumber</i>	Port containing the PIN that will be set
<i>value</i>	(HIGH/LOW)

## Returns

Status return Not\_Ok if the passed pin direction is in not set as output or pin number > 7, otherwise return Ok

Here is the caller graph for this function:



## 3.13 dio.h

[Go to the documentation of this file.](#)

```

1 /*
2  * dio.h
3  *
4  * Created: 9/6/2022 10:36:59 PM
5  * Author: Moataz
6  */
7
8
9 #ifndef DIO_H_
10 #define DIO_H_
11
12 #include "../Registers.h"
13 #include "../Interrupts.h"
14
15 //all internal driver typedefs
16 //all driver macros
17
18 #define Port_A 'A'

```

```

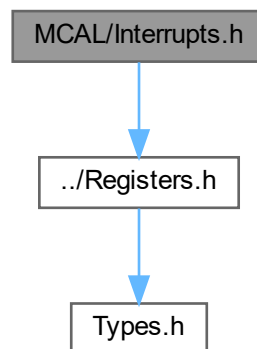
19 #define Port_B 'B'
20 #define Port_C 'C'
21 #define Port_D 'D'
22
23 //Pin Direction
24 #define IN 0
25 #define OUT 1
26
27 //PIN Value
28 #define LOW 0
29 #define HIGH 1
30
31 //all driver function prototypes
32
33 Status DIO_init(uint8_t pinNumber, uint8_t portNumber, uint8_t direction);
34
35 Status DIO_Write(uint8_t pinNumber, uint8_t portNumber, uint8_t value);
36 Status DIO_Toggle(uint8_t pinNumber, uint8_t portNumber);
37 Status DIO_Read(uint8_t pinNumber, uint8_t portNumber, uint8_t* value);
38
39
40
41 #endif /* DIO_H_ */

```

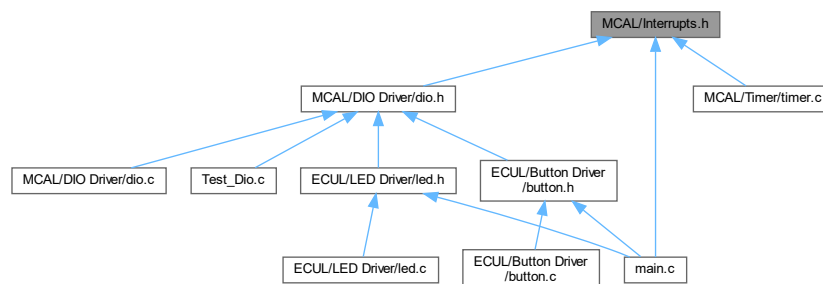
### 3.14 MCAL/Interrupts.h File Reference

```
#include "../Registers.h"
```

Include dependency graph for Interrupts.h:



This graph shows which files directly or indirectly include this file:



## Macros

- `#define TIMER0\_OVF __vector_12`
- `#define EXT\_INT\_0 __vector_1`
- `#define EXT\_INT\_1 __vector_2`
- `#define EXT\_INT\_2 __vector_3`
- `#define sei() __asm__ __volatile__("sei" ::: "memory")`  
*Enable the interrupt in the status register.*
- `#define cli() __asm__ __volatile__("cli" ::: "memory")`  
*clear the interrupt in the status register*
- `#define ISR(INT_VECT)`  
*Interrupt definition.*

### 3.14.1 Macro Definition Documentation

#### 3.14.1.1 cli

```
#define cli( ) __asm__ __volatile__("cli" ::: "memory")
```

clear the interrupt in the status register

#### 3.14.1.2 EXT\_INT\_0

```
#define EXT_INT_0 __vector_1
```

#### 3.14.1.3 EXT\_INT\_1

```
#define EXT_INT_1 __vector_2
```

#### 3.14.1.4 EXT\_INT\_2

```
#define EXT_INT_2 __vector_3
```

### 3.14.1.5 ISR

```
#define ISR(
    INT_VECT )
```

#### Value:

```
void INT_VECT(void) __attribute__((signal,used));\
void INT_VECT(void)
```

Interrupt definition.

### 3.14.1.6 sei

```
#define sei( ) __asm__ __volatile__("sei" ::: "memory")
```

Enable the interrupt in the status register.

### 3.14.1.7 TIMER0\_OVF

```
#define TIMER0_OVF __vector_12
```

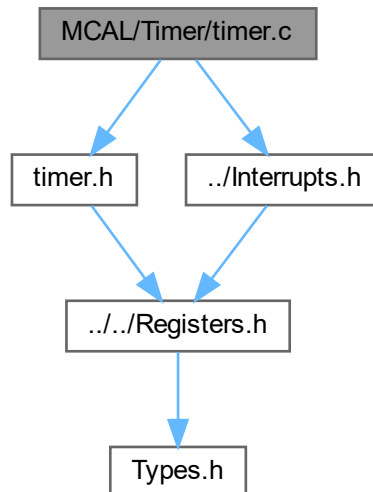
## 3.15 Interrupts.h

[Go to the documentation of this file.](#)

```
1 /*
2  * Interrupts.h
3  *
4  * Created: 9/9/2022 12:34:52 AM
5  * Author: Moataz
6  */
7
8
9
10 #ifndef INTERRUPTS_H_
11 #define INTERRUPTS_H_
12
13 #include "../Registers.h"
14
15 #define TIMER0_OVF __vector_12
16 #define EXT_INT_0 __vector_1
17 #define EXT_INT_1 __vector_2
18 #define EXT_INT_2 __vector_3
19
21 #define sei() __asm__ __volatile__("sei" ::: "memory")
22
24 #define cli() __asm__ __volatile__("cli" ::: "memory")
25
27 #define ISR(INT_VECT) void INT_VECT(void) __attribute__((signal,used));\
28 void INT_VECT(void)
29
30
31
32 #endif /* INTERRUPTS_H_ */
33
```

## 3.16 MCAL/Timer/timer.c File Reference

```
#include "timer.h"
#include "../Interrupts.h"
Include dependency graph for timer.c:
```



### Functions

- [Status timer0\\_Init](#) ([Timer\\_Mode](#) mode, [COM\\_Mode](#) comMode)  
*Initialize the timer 0.*
- [Status timer0\\_start](#) ([uint8\\_t](#) CmpValue, [clk\\_source\\_T0](#) prescaler)  
*Start the timer 0.*
- [Status timer0\\_stop](#) ()  
*stop the timer 0*

### 3.16.1 Detailed Description

#### Author

Moataz Khaled

#### Version

0.1

#### Date

2022-09-12

#### Copyright

Copyright (c) 2022

### 3.16.2 Function Documentation

#### 3.16.2.1 timer0\_Init()

```
Status timer0_Init (
    Timer_Mode mode,
    COM_Mode comMode )
```

Initialize the timer 0.

Initialize the TCCR0 set the Compare Match Output Mode set the WGM01 and WGM00

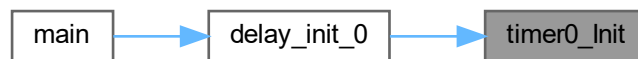
##### Parameters

<i>mode</i>	determine which mode will be used for counting and overflow of the interrupt
<i>comMode</i>	determine the compare match output mode

##### Returns

Status Ok for no error occurs, Not\_Ok for error during initialization

Here is the caller graph for this function:



#### 3.16.2.2 timer0\_start()

```
Status timer0_start (
    uint8_t CmpValue,
    clk_source_T0 prescalor )
```

Start the timer 0.

set the OCR0 with the cmp value set the prescalor in TCCR0

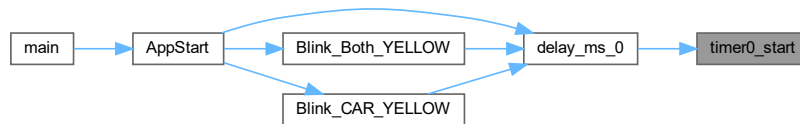
##### Parameters

<i>CmpValue</i>	the compare value at with the reset will occur
<i>prescalor</i>	the value of the prescalor (in the project it prescalor 64 will be used)

### Returns

Status returns ok after it starts the timer.

Here is the caller graph for this function:



### 3.16.2.3 timer0\_stop()

```
Status timer0_stop ( )
```

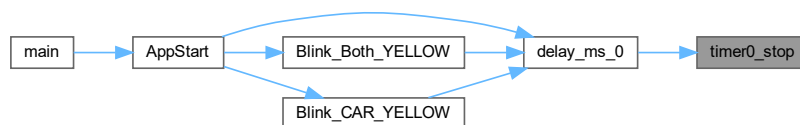
stop the timer 0

Clear TCCR0 and OCR0

### Returns

Status returns ok after it stops the timer.

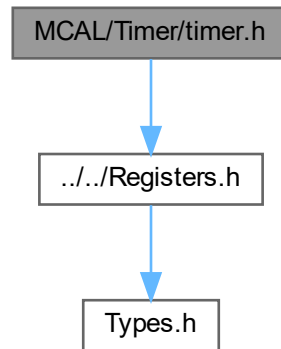
Here is the caller graph for this function:



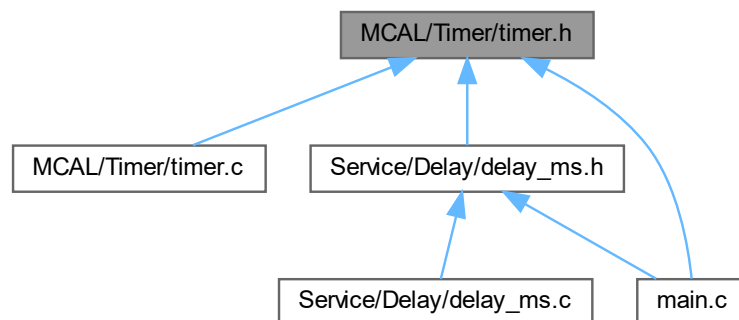
### 3.17 MCAL/Timer/timer.h File Reference

```
#include "../..../Registers.h"
```

Include dependency graph for timer.h:



This graph shows which files directly or indirectly include this file:



#### Macros

- `#define WGM01 PIN3`
- `#define WGM00 PIN6`

#### Typedefs

- typedef enum `Timer_Mode` `Timer_Mode`  
*timer mode enum*
- typedef enum `COM_Mode` `COM_Mode`  
*Compare Match Output Mode.*
- typedef enum `clk_source_T0` `clk_source_T0`  
*prescaler enum for timer 0*



## Enumerations

- enum `Timer_Mode` { `Timer_Normal` = 0 , `Phase_Correct` , `CTC` , `Fast_PWM` }  
*timer mode enum*
- enum `COM_Mode` { `NO_OUTPUT` =0 , `Toggle` , `Clear` , `Set` }  
*Compare Match Output Mode.*
- enum `clk_source_T0` {  
  `T0_No_Clk_Source` =0 , `T0_No_prescalor` , `T0_Precalor_8` , `T0_Precalor_64` ,  
  `T0_Precalor_256` , `T0_Precalor_1024` , `T0_Ext_falling` , `T0_Ext_Rising` }  
*prescalor enum for timer 0*

## Functions

- `Status timer0_Init` (`Timer_Mode` mode, `COM_Mode` comMode)  
*Initialize the timer 0.*
- `Status timer0_start` (`uint8_t` CmpValue, `clk_source_T0` prescalor)  
*Start the timer 0.*
- `Status timer0_stop` ()  
*stop the timer 0*

### 3.17.1 Macro Definition Documentation

#### 3.17.1.1 WGM00

```
#define WGM00 PIN6
```

#### 3.17.1.2 WGM01

```
#define WGM01 PIN3
```

### 3.17.2 Typedef Documentation

#### 3.17.2.1 clk\_source\_T0

```
typedef enum clk_source_T0 clk_source_T0
```

prescalor enum for timer 0

### 3.17.2.2 COM\_Mode

```
typedef enum COM_Mode COM_Mode
```

Compare Match Output Mode.

### 3.17.2.3 Timer\_Mode

```
typedef enum Timer_Mode Timer_Mode
```

timer mode enum

## 3.17.3 Enumeration Type Documentation

### 3.17.3.1 clk\_source\_T0

```
enum clk_source_T0
```

prescaler enum for timer 0

Enumerator

T0_No_Clk_Source	
T0_No_prescaler	
T0_Precalor_8	
T0_Precalor_64	
T0_Precalor_256	
T0_Precalor_1024	
T0_Ext_falling	
T0_Ext_Rising	

### 3.17.3.2 COM\_Mode

```
enum COM_Mode
```

Compare Match Output Mode.

Enumerator

NO_OUTPUT	
Toggle	
Clear	
Set	

### 3.17.3.3 Timer\_Mode

enum `Timer_Mode`

timer mode enum

Enumerator

Timer_Normal	
Phase_Correct	
CTC	
Fast_PWM	

## 3.17.4 Function Documentation

### 3.17.4.1 timer0\_Init()

```
Status timer0_Init (
    Timer_Mode mode,
    COM_Mode comMode )
```

Initialize the timer 0.

Initialize the TCCR0 set the Compare Match Output Mode set the WGM01 and WGM00

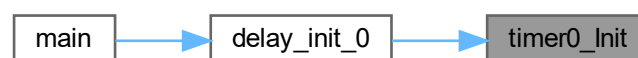
Parameters

<i>mode</i>	determine which mode will be used for counting and overflow of the interrupt
<i>comMode</i>	determine the compare match output mode

Returns

Status Ok for no error occurs, Not\_Ok for error during initialization

Here is the caller graph for this function:



### 3.17.4.2 timer0\_start()

```
Status timer0_start (
    uint8_t CmpValue,
    clk_source_T0 prescalor )
```

Start the timer 0.

set the OCR0 with the cmp value set the prescalor in TCCR0

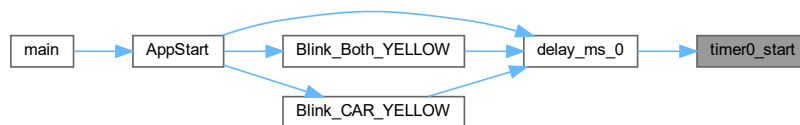
#### Parameters

<i>CmpValue</i>	the compare value at with the reset will occur
<i>prescalor</i>	the value of the prescalor (in the project it prescalor 64 will be used)

#### Returns

Status returns ok after it starts the timer.

Here is the caller graph for this function:



### 3.17.4.3 timer0\_stop()

```
Status timer0_stop ( )
```

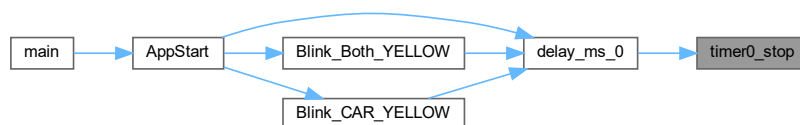
stop the timer 0

Clear TCCR0 and OCR0

#### Returns

Status returns ok after it stops the timer.

Here is the caller graph for this function:



## 3.18 timer.h

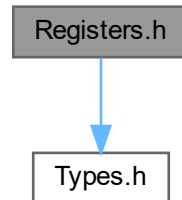
[Go to the documentation of this file.](#)

```
1 /*
2  * timer1.h
3  *
4  * Created: 9/8/2022 9:41:41 PM
5  * Author: Moataz
6  */
7
8
9 #ifndef TIMER0_H_
10 #define TIMER0_H_
11
12
13 #include "../Registers.h"
14
15
16 #define WGM01 PIN3
17 #define WGM00 PIN6
18
19 typedef enum Timer_Mode{
20     Timer_Normal = 0,
21     Phase_Correct,
22     CTC,
23     Fast_PWM
24 }Timer_Mode;
25
26
27 typedef enum COM_Mode{
28     NO_OUTPUT =0,
29     Toggle, //only applicable in CTC mode
30     Clear,
31     Set
32 }COM_Mode;
33
34
35 typedef enum clk_source_T0 {
36     T0_No_Clk_Source =0,
37     T0_No_prescalor,
38     T0_Precalor_8,
39     T0_Precalor_64,
40     T0_Precalor_256,
41     T0_Precalor_1024,
42     T0_Ext_falling,
43     T0_Ext_Rising
44 }clk_source_T0;
45
46
47
48
49 Status timer0_Init(Timer_Mode mode,COM_Mode comMode);
50 Status timer0_start(uint8_t CmpValue,clk_source_T0 prescalor);
51 Status timer0_stop();
52
53
54
55
56 #endif /* TIMER1_H_ */
```

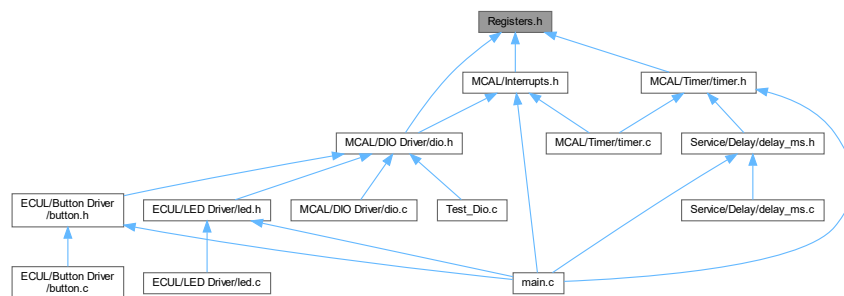
### 3.19 Registers.h File Reference

```
#include "Types.h"
```

Include dependency graph for Registers.h:



This graph shows which files directly or indirectly include this file:



#### Macros

- `#define PORTA (*(volatile uint8_t*) 0x3B)`
- `#define DDRA (*(volatile uint8_t*) 0x3A)`
- `#define PINA (*(volatile uint8_t*) 0x39)`
- `#define PORTB (*(volatile uint8_t*) 0x38)`
- `#define DDRB (*(volatile uint8_t*) 0x37)`
- `#define PINB (*(volatile uint8_t*) 0x36)`
- `#define PORTC (*(volatile uint8_t*) 0x35)`
- `#define DDRC (*(volatile uint8_t*) 0x34)`
- `#define PINC (*(volatile uint8_t*) 0x33)`
- `#define PORTD (*(volatile uint8_t*) 0x32)`
- `#define DDRD (*(volatile uint8_t*) 0x31)`
- `#define PIND (*(volatile uint8_t*) 0x30)`
- `#define TCCR0 (*(volatile uint8_t*) 0x53)`
- `#define TCNT0 (*(volatile uint8_t*) 0x52)`
- `#define OCR0 (*(volatile uint8_t*) 0x5C)`
- `#define TCCR2 (*(volatile uint8_t*) 0x45)`

- `#define TCNT2 (*(volatile uint8_t*) 0x44)`
- `#define OCR2 (*(volatile uint8_t*) 0x43)`
- `#define TIFR (*(volatile uint8_t*) 0x58)`
- `#define SREG (*(volatile uint8_t*) 0x5F)`
- `#define MCUCR (*(volatile uint8_t*) 0x55)`
- `#define MCUCSR (*(volatile uint8_t*) 0x54)`
- `#define GICR (*(volatile uint8_t*) 0x5B)`
- `#define GIFR (*(volatile uint8_t*) 0x5A)`
- `#define ISC00 0`
- `#define ISC01 1`
- `#define INT0 6`
- `#define PIN0 0`
- `#define PIN1 1`
- `#define PIN2 2`
- `#define PIN3 3`
- `#define PIN4 4`
- `#define PIN5 5`
- `#define PIN6 6`
- `#define PIN7 7`
- `#define bitset(byte, nbit) ((byte) |= (1<<(nbit)))`
- `#define bitclear(byte, nbit) ((byte) &= ~(1<<(nbit)))`
- `#define bitflip(byte, nbit) ((byte) ^= (1<<(nbit)))`
- `#define bitRead(byte, nbit) (((byte) & (1<<(nbit))) >> nbit)`

### 3.19.1 Macro Definition Documentation

#### 3.19.1.1 bitclear

```
#define bitclear(  
    byte,  
    nbit ) ((byte) &= ~(1<<(nbit)))
```

#### 3.19.1.2 bitflip

```
#define bitflip(  
    byte,  
    nbit ) ((byte) ^= (1<<(nbit)))
```

#### 3.19.1.3 bitRead

```
#define bitRead(  
    byte,  
    nbit ) (((byte) & (1<<(nbit))) >> nbit)
```

#### 3.19.1.4 **bitset**

```
#define bitset(  
    byte,  
    nbit ) ((byte) |= (1<<(nbit)))
```

#### 3.19.1.5 **DDRA**

```
#define DDRA (*(volatile uint8_t*) 0x3A)
```

#### 3.19.1.6 **DDRB**

```
#define DDRB (*(volatile uint8_t*) 0x37)
```

#### 3.19.1.7 **DDRC**

```
#define DDRC (*(volatile uint8_t*) 0x34)
```

#### 3.19.1.8 **DDRD**

```
#define DDRD (*(volatile uint8_t*) 0x31)
```

#### 3.19.1.9 **GICR**

```
#define GICR (*(volatile uint8_t*) 0x5B)
```

#### 3.19.1.10 **GIFR**

```
#define GIFR (*(volatile uint8_t*) 0x5A)
```



#### 3.19.1.11 INT0

```
#define INT0 6
```

#### 3.19.1.12 ISC00

```
#define ISC00 0
```

#### 3.19.1.13 ISC01

```
#define ISC01 1
```

#### 3.19.1.14 MCUCR

```
#define MCUCR (*(volatile uint8_t*) 0x55)
```

#### 3.19.1.15 MCUCSR

```
#define MCUCSR (*(volatile uint8_t*) 0x54)
```

#### 3.19.1.16 OCR0

```
#define OCR0 (*(volatile uint8_t*) 0x5C)
```

#### 3.19.1.17 OCR2

```
#define OCR2 (*(volatile uint8_t*) 0x43)
```

#### 3.19.1.18 PIN0

```
#define PIN0 0
```

**3.19.1.19 PIN1**

```
#define PIN1 1
```

**3.19.1.20 PIN2**

```
#define PIN2 2
```

**3.19.1.21 PIN3**

```
#define PIN3 3
```

**3.19.1.22 PIN4**

```
#define PIN4 4
```

**3.19.1.23 PIN5**

```
#define PIN5 5
```

**3.19.1.24 PIN6**

```
#define PIN6 6
```

**3.19.1.25 PIN7**

```
#define PIN7 7
```

**3.19.1.26 PINA**

```
#define PINA (*(volatile uint8_t*) 0x39)
```

#### 3.19.1.27 PINB

```
#define PINB (*(volatile uint8_t*) 0x36)
```

#### 3.19.1.28 PINC

```
#define PINC (*(volatile uint8_t*) 0x33)
```

#### 3.19.1.29 PIND

```
#define PIND (*(volatile uint8_t*) 0x30)
```

#### 3.19.1.30 PORTA

```
#define PORTA (*(volatile uint8_t*) 0x3B)
```

#### 3.19.1.31 PORTB

```
#define PORTB (*(volatile uint8_t*) 0x38)
```

#### 3.19.1.32 PORTC

```
#define PORTC (*(volatile uint8_t*) 0x35)
```

#### 3.19.1.33 PORTD

```
#define PORTD (*(volatile uint8_t*) 0x32)
```

#### 3.19.1.34 SREG

```
#define SREG (*(volatile uint8_t*) 0x5F)
```

**3.19.1.35 TCCR0**

```
#define TCCR0 (*(volatile uint8_t*) 0x53)
```

**3.19.1.36 TCCR2**

```
#define TCCR2 (*(volatile uint8_t*) 0x45)
```

**3.19.1.37 TCNT0**

```
#define TCNT0 (*(volatile uint8_t*) 0x52)
```

**3.19.1.38 TCNT2**

```
#define TCNT2 (*(volatile uint8_t*) 0x44)
```

**3.19.1.39 TIFR**

```
#define TIFR (*(volatile uint8_t*) 0x58)
```

**3.20 Registers.h**

[Go to the documentation of this file.](#)

```
1 /*
2  * Registers.h
3  *
4  * Created: 9/6/2022 9:50:40 PM
5  * Author: Moataz
6  */
7 /*****
8  * All MicroController Registers for ATMEGA32A
9  */
10 /*****
11
12
13
14 #ifndef REGISTERS_H_
15 #define REGISTERS_H_
16
17 //include
18 #include "Types.h"
19
20
21 //Definitions
22 /*****
23  * DIO Registers for ATMEGA32A
24  */
25 /*****
26
```

```

27 // PORTA register
28 #define PORTA (*(volatile uint8_t*) 0x3B)
29 #define DDRA (*(volatile uint8_t*)0x3A)
30 #define PINA (*(volatile uint8_t*) 0x39)
31
32 // PORTB register
33 #define PORTB (*(volatile uint8_t*) 0x38)
34 #define DDRB (*(volatile uint8_t*) 0x37)
35 #define PINB (*(volatile uint8_t*) 0x36)
36
37 // PORTC register
38 #define PORTC (*(volatile uint8_t*) 0x35)
39 #define DDRC (*(volatile uint8_t*)0x34)
40 #define PINC (*(volatile uint8_t*) 0x33)
41
42 // PORTD register
43 #define PORTD (*(volatile uint8_t*) 0x32)
44 #define DDRD (*(volatile uint8_t*) 0x31)
45 #define PIND (*(volatile uint8_t*) 0x30)
46
47 /*****
48 /* Timer Registers for ATMEGA32A
49 */
50 /*****
51
52 //Timer 0 registers
53 #define TCCR0 (*(volatile uint8_t*) 0x53)
54 #define TCNT0 (*(volatile uint8_t*) 0x52)
55 #define OCR0 (*(volatile uint8_t*) 0x5C)
56
57 // Timer 2 registers
58 #define TCCR2 (*(volatile uint8_t*) 0x45)
59 #define TCNT2 (*(volatile uint8_t*) 0x44)
60 #define OCR2 (*(volatile uint8_t*) 0x43)
61
62
63 #define TIFR (*(volatile uint8_t*) 0x58)
64 /*****
65 /* Status Register for ATMEGA32A
66 */
67 /*****
68
69 #define SREG (*(volatile uint8_t*) 0x5F)
70
71 /*****
72 /* External Interrupt Registers for ATMEGA32A
73 */
74 /*****
75 #define MCUCR (*(volatile uint8_t*) 0x55)
76 #define MCUCSR (*(volatile uint8_t*) 0x54)
77 #define GICR (*(volatile uint8_t*) 0x5B)
78 #define GIFR (*(volatile uint8_t*) 0x5A)
79
80 #define ISC00 0
81 #define ISC01 1
82 #define INTO 6
83
84 /*****
85 /* Definition of the bits of the registers
86 */
87 /*****
88
89 #define PIN0 0
90 #define PIN1 1
91 #define PIN2 2
92 #define PIN3 3
93 #define PIN4 4
94 #define PIN5 5
95 #define PIN6 6
96 #define PIN7 7
97
98 //function like macros for register and bit accessing
99 #define bitset(byte,nbit) ((byte) |= (1<<(nbit)))
100 #define bitclear(byte,nbit) ((byte) &= ~(1<<(nbit)))
101 #define bitflip(byte,nbit) ((byte) ^= (1<<(nbit)))
102 #define bitRead(byte,nbit) (((byte) & (1<<(nbit))) >> nbit)
103
104
105 #endif /* REGISTERS_H_ */

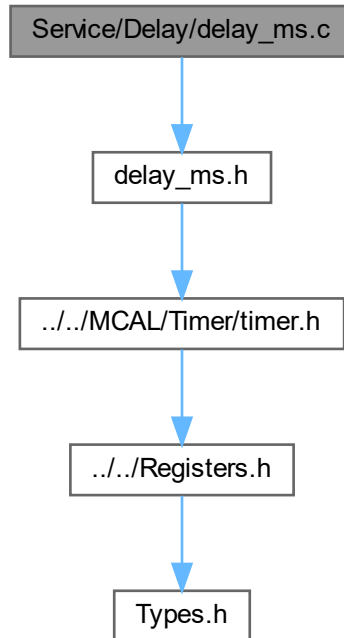
```

## 3.21 Service/Delay/delay\_ms.c File Reference

Implements Delays to be used in the program using the Timer driver.

```
#include "delay_ms.h"
```

Include dependency graph for delay\_ms.c:



## Functions

- [Status](#) `delay_init_0` ([Timer\\_Mode](#) mode, [COM\\_Mode](#) comMode)  
*Initialize timer 0 with the provided Timer mode and compare match output mode.*
- [Status](#) `delay_ms_0` (volatile [uint16\\_t](#) delay\_ms)  
*perform a delay with the required time passed in delay\_ms*

### 3.21.1 Detailed Description

Implements Delays to be used in the program using the Timer driver.

#### Author

Moataz Khaled

#### Version

0.1

#### Date

2022-09-12

#### Copyright

Copyright (c) 2022

## 3.21.2 Function Documentation

### 3.21.2.1 delay\_init\_0()

```
Status delay_init_0 (  
    Timer_Mode mode,  
    COM_Mode comMode )
```

Initialize timer 0 with the provided Timer mode and compare match output mode.

calls the [timer0\\_Init\(\)](#) to initialize the timer with the provided Timer mode and compare match output mode

#### Parameters

<i>mode</i>	determine which mode will be used for counting and overflow of the interrupt
<i>comMode</i>	determine the compare match output mode

#### See also

[timer0\\_Init\(\)](#)

#### Returns

Status Ok for no error occurs, Not\_Ok for error during initialization

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.21.2.2 delay\_ms\_0()

```
Status delay_ms_0 (
    volatile uint16_t delay_ms )
```

perform a delay with the required time passed in delay\_ms

according to the presecalar used, the function will calculate the number of overflows and the OCR and performs a loop the timer 0 reach the OCR the exact number of overflows

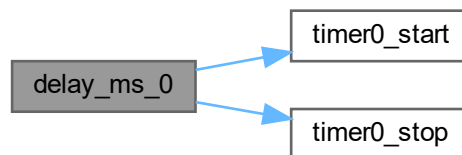
#### Parameters

<i>delay_ms</i>	The amount of delay in milli second
-----------------	-------------------------------------

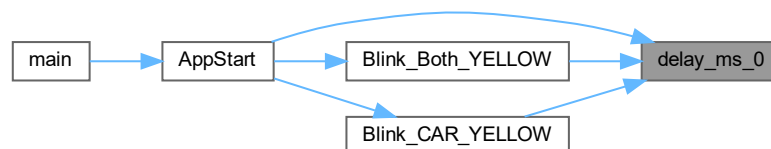
#### Returns

Status Not\_Ok if the component failed to perform the delay otherwise will return OK.

Here is the call graph for this function:



Here is the caller graph for this function:

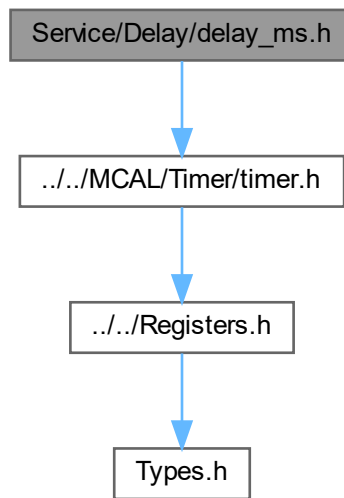


## 3.22 Service/Delay/delay\_ms.h File Reference

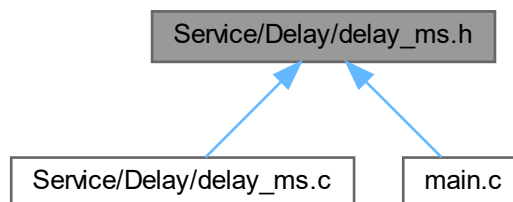
```
#include "../MCAL/Timer/timer.h"
```



Include dependency graph for delay\_ms.h:



This graph shows which files directly or indirectly include this file:



## Functions

- [Status delay\\_init\\_0](#) ([Timer\\_Mode](#) mode, [COM\\_Mode](#) comMode)  
*Initialize timer 0 with the provided Timer mode and compare match output mode.*
- [Status delay\\_ms\\_0](#) ([uint16\\_t](#) delay\_ms)  
*perform a delay with the required time passed in delay\_ms*
- [Status Stop\\_delay](#) ()

### 3.22.1 Function Documentation

### 3.22.1.1 delay\_init\_0()

```
Status delay_init_0 (  
    Timer_Mode mode,  
    COM_Mode comMode )
```

Initialize timer 0 with the provided Timer mode and compare match output mode.

calls the [timer0\\_Init\(\)](#) to initialize the timer with the provided Timer mode and compare match output mode

#### Parameters

<i>mode</i>	determine which mode will be used for counting and overflow of the interrupt
<i>comMode</i>	determine the compare match output mode

#### See also

[timer0\\_Init\(\)](#)

#### Returns

Status Ok for no error occurs, Not\_Ok for error during initialization

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.22.1.2 delay\_ms\_0()

```
Status delay_ms_0 (  
    volatile uint16_t delay_ms )
```

perform a delay with the required time passed in delay\_ms

according to the presecalar used, the function will calculate the number of overflows and the OCR and performs a loop the timer 0 reach the OCR the exact number of overflows

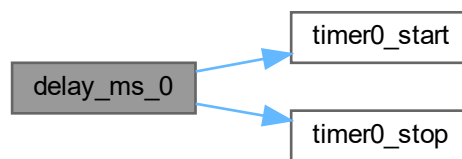
**Parameters**

<i>delay_ms</i>	The amount of delay in milli second
-----------------	-------------------------------------

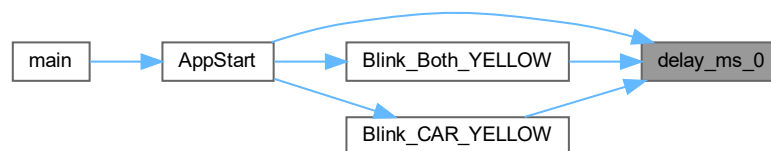
**Returns**

Status Not\_Ok if the component failed to perform the delay otherwise will return OK.

Here is the call graph for this function:



Here is the caller graph for this function:

**3.22.1.3 Stop\_delay()**

```
Status Stop_delay ( )
```

**3.23 delay\_ms.h**

[Go to the documentation of this file.](#)

```

1 /*
2  * delay.h
3  *
4  * Created: 9/10/2022 10:30:37 PM
5  * Author: Moataz
6  */
  
```

```

7
8
9 #ifndef DELAY_H_
10 #define DELAY_H_
11
12
13 //includes
14 #include "../../MCAL/Timer/timer.h"
15
16 //Definitions
17
18 //Functions prototype
19 Status delay_init_0(Timer_Mode mode, COM_Mode comMode);
20
21
22
23 Status delay_ms_0(uint16_t delay_ms);
24
25
26 Status Stop_delay();
27
28 #endif /* DELAY_H_ */

```

## 3.24 Test\_Dio.c File Reference

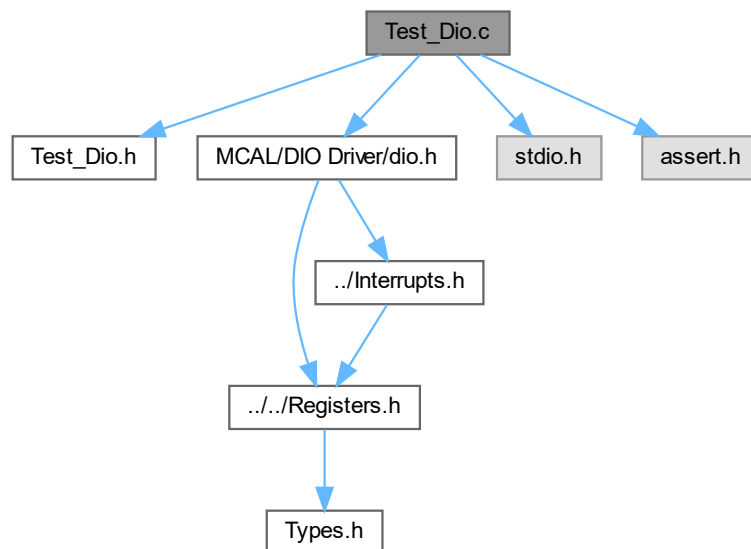
file contain the tests for DIO Driver

```

#include "Test_Dio.h"
#include "MCAL/DIO Driver/dio.h"
#include <stdio.h>
#include <assert.h>

```

Include dependency graph for Test\_Dio.c:



## Functions

- void [TRAFF\\_DIO\\_001](#) ()

- void [TRAFF\\_DIO\\_002](#) ()
- void [TRAFF\\_DIO\\_003](#) ()
- void [TRAFF\\_DIO\\_004](#) ()
- void [TRAFF\\_DIO\\_005](#) ()
- void [TRAFF\\_DIO\\_006](#) ()
- void [TRAFF\\_DIO\\_007](#) ()
- void [TRAFF\\_DIO\\_008](#) ()
- void [TRAFF\\_DIO\\_009](#) ()
- void [TRAFF\\_DIO\\_010](#) ()
- void [TRAFF\\_DIO\\_011](#) ()
- void [TRAFF\\_DIO\\_012](#) ()
- void [TRAFF\\_DIO\\_013](#) ()
- void [TRAFF\\_DIO\\_014](#) ()
- void [TRAFF\\_DIO\\_015](#) ()
- void [TRAFF\\_DIO\\_016](#) ()
- void [TRAFF\\_DIO\\_017](#) ()
- void [TRAFF\\_DIO\\_018](#) ()
- void [TRAFF\\_DIO\\_019](#) ()
- void [TRAFF\\_DIO\\_020](#) ()
- void [TRAFF\\_DIO\\_021](#) ()
- void [TRAFF\\_DIO\\_022](#) ()
- void [TRAFF\\_DIO\\_023](#) ()
- void [TRAFF\\_DIO\\_024](#) ()
- void [TRAFF\\_DIO\\_025](#) ()
- void [TRAFF\\_DIO\\_026](#) ()
- void [TRAFF\\_DIO\\_027](#) ()
- void [TRAFF\\_DIO\\_028](#) ()
- void [TRAFF\\_DIO\\_029](#) ()
- void [TRAFF\\_DIO\\_030](#) ()
- void [TRAFF\\_DIO\\_031](#) ()
- void [TRAFF\\_DIO\\_032](#) ()
- void [TRAFF\\_DIO\\_033](#) ()
- void [TRAFF\\_DIO\\_034](#) ()
- void [TRAFF\\_DIO\\_035](#) ()

### 3.24.1 Detailed Description

file contain the tests for DIO Driver

#### Author

Moataz Khaled

#### Version

0.1

#### Date

2022-09-13

#### Copyright

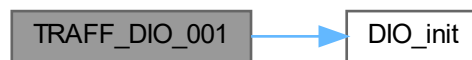
Copyright (c) 2022

## 3.24.2 Function Documentation

### 3.24.2.1 TRAFF\_DIO\_001()

```
void TRAFF_DIO_001 ( )
```

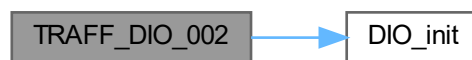
Here is the call graph for this function:



### 3.24.2.2 TRAFF\_DIO\_002()

```
void TRAFF_DIO_002 ( )
```

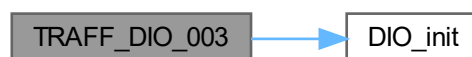
Here is the call graph for this function:



### 3.24.2.3 TRAFF\_DIO\_003()

```
void TRAFF_DIO_003 ( )
```

Here is the call graph for this function:



#### 3.24.2.4 TRAFF\_DIO\_004()

```
void TRAFF_DIO_004 ( )
```

Here is the call graph for this function:



#### 3.24.2.5 TRAFF\_DIO\_005()

```
void TRAFF_DIO_005 ( )
```

Here is the call graph for this function:



#### 3.24.2.6 TRAFF\_DIO\_006()

```
void TRAFF_DIO_006 ( )
```

Here is the call graph for this function:





### 3.24.2.7 TRAFF\_DIO\_007()

```
void TRAFF_DIO_007 ( )
```

Here is the call graph for this function:



### 3.24.2.8 TRAFF\_DIO\_008()

```
void TRAFF_DIO_008 ( )
```

Here is the call graph for this function:



### 3.24.2.9 TRAFF\_DIO\_009()

```
void TRAFF_DIO_009 ( )
```

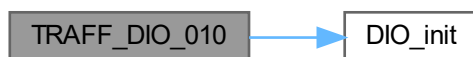
Here is the call graph for this function:



### 3.24.2.10 TRAFF\_DIO\_010()

```
void TRAFF_DIO_010 ( )
```

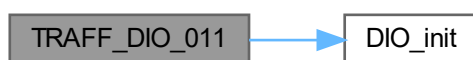
Here is the call graph for this function:



### 3.24.2.11 TRAFF\_DIO\_011()

```
void TRAFF_DIO_011 ( )
```

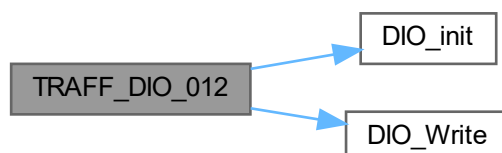
Here is the call graph for this function:



### 3.24.2.12 TRAFF\_DIO\_012()

```
void TRAFF_DIO_012 ( )
```

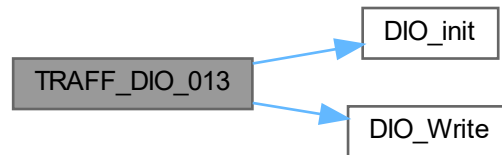
Here is the call graph for this function:



### 3.24.2.13 TRAFF\_DIO\_013()

```
void TRAFF_DIO_013 ( )
```

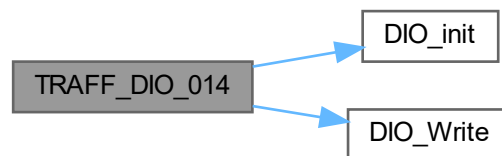
Here is the call graph for this function:



### 3.24.2.14 TRAFF\_DIO\_014()

```
void TRAFF_DIO_014 ( )
```

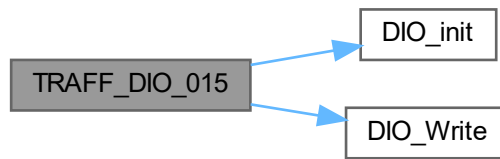
Here is the call graph for this function:



### 3.24.2.15 TRAFF\_DIO\_015()

```
void TRAFF_DIO_015 ( )
```

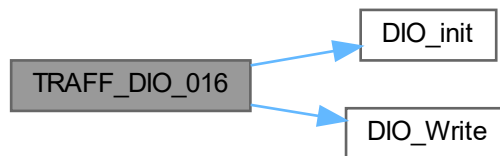
Here is the call graph for this function:



### 3.24.2.16 TRAFF\_DIO\_016()

```
void TRAFF_DIO_016 ( )
```

Here is the call graph for this function:



### 3.24.2.17 TRAFF\_DIO\_017()

```
void TRAFF_DIO_017 ( )
```

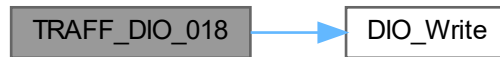
Here is the call graph for this function:



**3.24.2.18 TRAFF\_DIO\_018()**

```
void TRAFF_DIO_018 ( )
```

Here is the call graph for this function:

**3.24.2.19 TRAFF\_DIO\_019()**

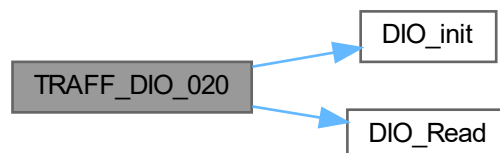
```
void TRAFF_DIO_019 ( )
```

Here is the call graph for this function:

**3.24.2.20 TRAFF\_DIO\_020()**

```
void TRAFF_DIO_020 ( )
```

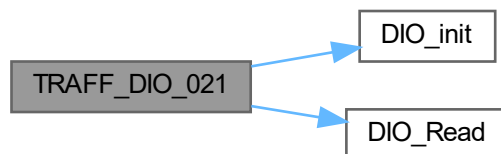
Here is the call graph for this function:



### 3.24.2.21 TRAFF\_DIO\_021()

```
void TRAFF_DIO_021 ( )
```

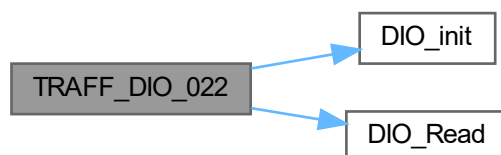
Here is the call graph for this function:



### 3.24.2.22 TRAFF\_DIO\_022()

```
void TRAFF_DIO_022 ( )
```

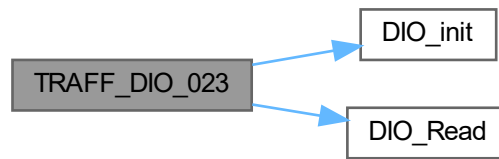
Here is the call graph for this function:



### 3.24.2.23 TRAFF\_DIO\_023()

```
void TRAFF_DIO_023 ( )
```

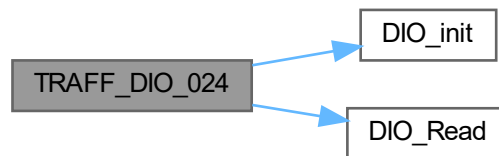
Here is the call graph for this function:



#### 3.24.2.24 TRAFF\_DIO\_024()

```
void TRAFF_DIO_024 ( )
```

Here is the call graph for this function:



#### 3.24.2.25 TRAFF\_DIO\_025()

```
void TRAFF_DIO_025 ( )
```

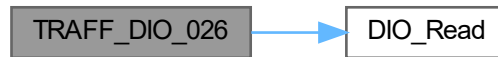
Here is the call graph for this function:



### 3.24.2.26 TRAFF\_DIO\_026()

```
void TRAFF_DIO_026 ( )
```

Here is the call graph for this function:



### 3.24.2.27 TRAFF\_DIO\_027()

```
void TRAFF_DIO_027 ( )
```

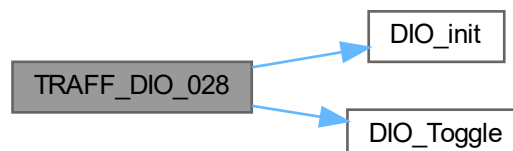
Here is the call graph for this function:



### 3.24.2.28 TRAFF\_DIO\_028()

```
void TRAFF_DIO_028 ( )
```

Here is the call graph for this function:

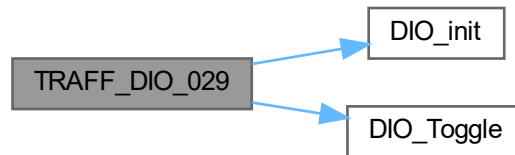




### 3.24.2.29 TRAFF\_DIO\_029()

```
void TRAFF_DIO_029 ( )
```

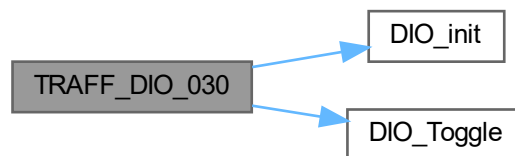
Here is the call graph for this function:



### 3.24.2.30 TRAFF\_DIO\_030()

```
void TRAFF_DIO_030 ( )
```

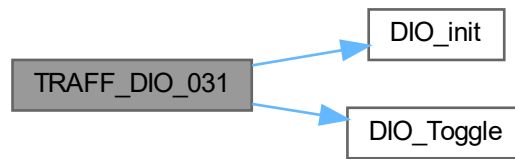
Here is the call graph for this function:



### 3.24.2.31 TRAFF\_DIO\_031()

```
void TRAFF_DIO_031 ( )
```

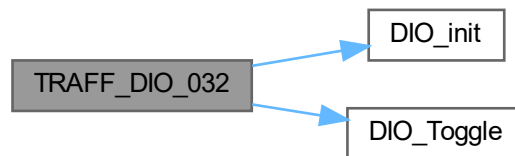
Here is the call graph for this function:



### 3.24.2.32 TRAFF\_DIO\_032()

```
void TRAFF_DIO_032 ( )
```

Here is the call graph for this function:



### 3.24.2.33 TRAFF\_DIO\_033()

```
void TRAFF_DIO_033 ( )
```

Here is the call graph for this function:



#### 3.24.2.34 TRAFF\_DIO\_034()

```
void TRAFF_DIO_034 ( )
```

Here is the call graph for this function:



#### 3.24.2.35 TRAFF\_DIO\_035()

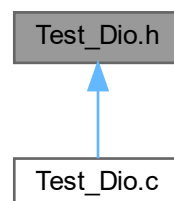
```
void TRAFF_DIO_035 ( )
```

Here is the call graph for this function:



## 3.25 Test\_Dio.h File Reference

This graph shows which files directly or indirectly include this file:



## Macros

- `#define PORT_E 'E'`

## Functions

- void [TRAFF\\_DIO\\_001](#) ()
- void [TRAFF\\_DIO\\_002](#) ()
- void [TRAFF\\_DIO\\_003](#) ()
- void [TRAFF\\_DIO\\_004](#) ()
- void [TRAFF\\_DIO\\_005](#) ()
- void [TRAFF\\_DIO\\_006](#) ()
- void [TRAFF\\_DIO\\_007](#) ()
- void [TRAFF\\_DIO\\_008](#) ()
- void [TRAFF\\_DIO\\_009](#) ()
- void [TRAFF\\_DIO\\_010](#) ()
- void [TRAFF\\_DIO\\_011](#) ()
- void [TRAFF\\_DIO\\_012](#) ()
- void [TRAFF\\_DIO\\_013](#) ()
- void [TRAFF\\_DIO\\_014](#) ()
- void [TRAFF\\_DIO\\_015](#) ()
- void [TRAFF\\_DIO\\_016](#) ()
- void [TRAFF\\_DIO\\_017](#) ()
- void [TRAFF\\_DIO\\_018](#) ()
- void [TRAFF\\_DIO\\_019](#) ()
- void [TRAFF\\_DIO\\_020](#) ()
- void [TRAFF\\_DIO\\_021](#) ()
- void [TRAFF\\_DIO\\_022](#) ()
- void [TRAFF\\_DIO\\_023](#) ()
- void [TRAFF\\_DIO\\_024](#) ()
- void [TRAFF\\_DIO\\_025](#) ()
- void [TRAFF\\_DIO\\_026](#) ()
- void [TRAFF\\_DIO\\_027](#) ()
- void [TRAFF\\_DIO\\_028](#) ()
- void [TRAFF\\_DIO\\_029](#) ()
- void [TRAFF\\_DIO\\_030](#) ()
- void [TRAFF\\_DIO\\_031](#) ()
- void [TRAFF\\_DIO\\_032](#) ()
- void [TRAFF\\_DIO\\_033](#) ()
- void [TRAFF\\_DIO\\_034](#) ()
- void [TRAFF\\_DIO\\_035](#) ()

### 3.25.1 Macro Definition Documentation

#### 3.25.1.1 PORT\_E

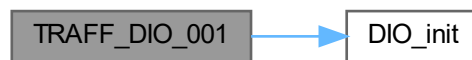
```
#define PORT_E 'E'
```

## 3.25.2 Function Documentation

### 3.25.2.1 TRAFF\_DIO\_001()

```
void TRAFF_DIO_001 ( )
```

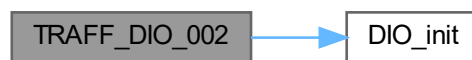
Here is the call graph for this function:



### 3.25.2.2 TRAFF\_DIO\_002()

```
void TRAFF_DIO_002 ( )
```

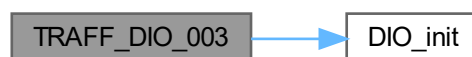
Here is the call graph for this function:



### 3.25.2.3 TRAFF\_DIO\_003()

```
void TRAFF_DIO_003 ( )
```

Here is the call graph for this function:



### 3.25.2.4 TRAFF\_DIO\_004()

```
void TRAFF_DIO_004 ( )
```

Here is the call graph for this function:



### 3.25.2.5 TRAFF\_DIO\_005()

```
void TRAFF_DIO_005 ( )
```

Here is the call graph for this function:



### 3.25.2.6 TRAFF\_DIO\_006()

```
void TRAFF_DIO_006 ( )
```

Here is the call graph for this function:



### 3.25.2.7 TRAFF\_DIO\_007()

```
void TRAFF_DIO_007 ( )
```

Here is the call graph for this function:



### 3.25.2.8 TRAFF\_DIO\_008()

```
void TRAFF_DIO_008 ( )
```

Here is the call graph for this function:



### 3.25.2.9 TRAFF\_DIO\_009()

```
void TRAFF_DIO_009 ( )
```

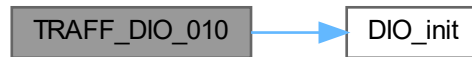
Here is the call graph for this function:



### 3.25.2.10 TRAFF\_DIO\_010()

```
void TRAFF_DIO_010 ( )
```

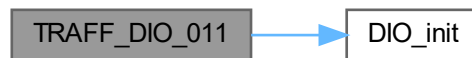
Here is the call graph for this function:



### 3.25.2.11 TRAFF\_DIO\_011()

```
void TRAFF_DIO_011 ( )
```

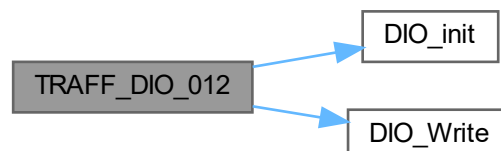
Here is the call graph for this function:



### 3.25.2.12 TRAFF\_DIO\_012()

```
void TRAFF_DIO_012 ( )
```

Here is the call graph for this function:

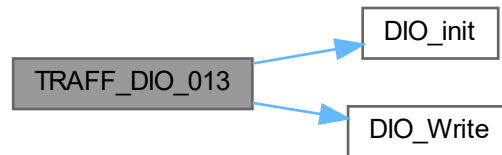




**3.25.2.13 TRAFF\_DIO\_013()**

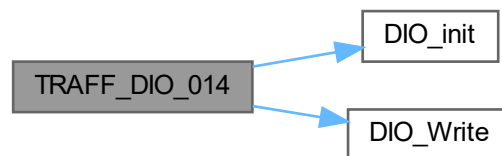
```
void TRAFF_DIO_013 ( )
```

Here is the call graph for this function:

**3.25.2.14 TRAFF\_DIO\_014()**

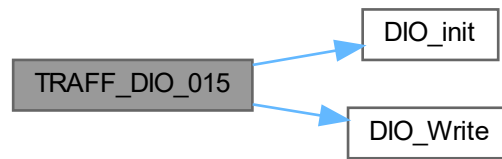
```
void TRAFF_DIO_014 ( )
```

Here is the call graph for this function:

**3.25.2.15 TRAFF\_DIO\_015()**

```
void TRAFF_DIO_015 ( )
```

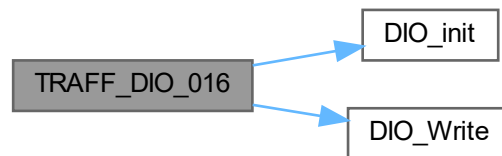
Here is the call graph for this function:



### 3.25.2.16 TRAFF\_DIO\_016()

```
void TRAFF_DIO_016 ( )
```

Here is the call graph for this function:



### 3.25.2.17 TRAFF\_DIO\_017()

```
void TRAFF_DIO_017 ( )
```

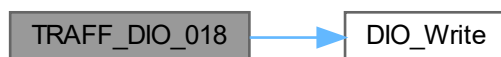
Here is the call graph for this function:



**3.25.2.18 TRAFF\_DIO\_018()**

```
void TRAFF_DIO_018 ( )
```

Here is the call graph for this function:

**3.25.2.19 TRAFF\_DIO\_019()**

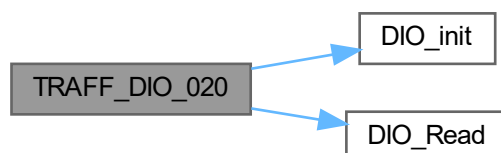
```
void TRAFF_DIO_019 ( )
```

Here is the call graph for this function:

**3.25.2.20 TRAFF\_DIO\_020()**

```
void TRAFF_DIO_020 ( )
```

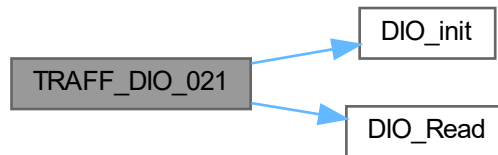
Here is the call graph for this function:



### 3.25.2.21 TRAFF\_DIO\_021()

```
void TRAFF_DIO_021 ( )
```

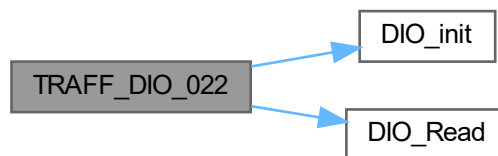
Here is the call graph for this function:



### 3.25.2.22 TRAFF\_DIO\_022()

```
void TRAFF_DIO_022 ( )
```

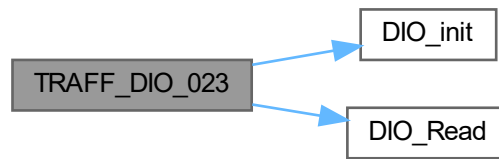
Here is the call graph for this function:



### 3.25.2.23 TRAFF\_DIO\_023()

```
void TRAFF_DIO_023 ( )
```

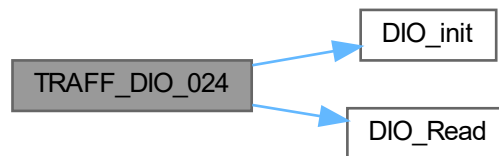
Here is the call graph for this function:



#### 3.25.2.24 TRAFF\_DIO\_024()

```
void TRAFF_DIO_024 ( )
```

Here is the call graph for this function:



#### 3.25.2.25 TRAFF\_DIO\_025()

```
void TRAFF_DIO_025 ( )
```

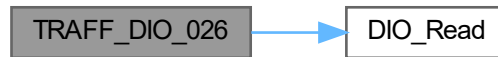
Here is the call graph for this function:



### 3.25.2.26 TRAFF\_DIO\_026()

```
void TRAFF_DIO_026 ( )
```

Here is the call graph for this function:



### 3.25.2.27 TRAFF\_DIO\_027()

```
void TRAFF_DIO_027 ( )
```

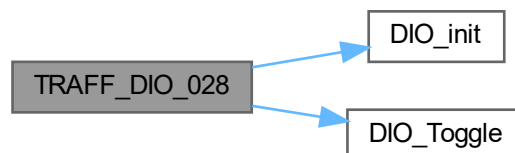
Here is the call graph for this function:



### 3.25.2.28 TRAFF\_DIO\_028()

```
void TRAFF_DIO_028 ( )
```

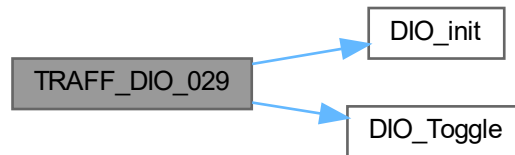
Here is the call graph for this function:



**3.25.2.29 TRAFF\_DIO\_029()**

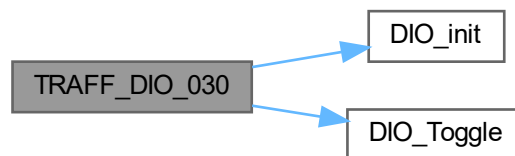
```
void TRAFF_DIO_029 ( )
```

Here is the call graph for this function:

**3.25.2.30 TRAFF\_DIO\_030()**

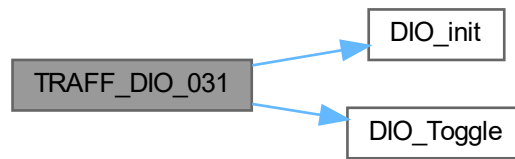
```
void TRAFF_DIO_030 ( )
```

Here is the call graph for this function:

**3.25.2.31 TRAFF\_DIO\_031()**

```
void TRAFF_DIO_031 ( )
```

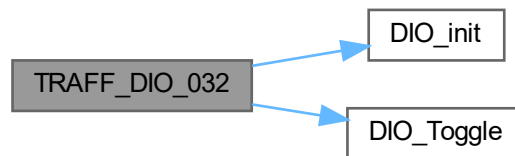
Here is the call graph for this function:



### 3.25.2.32 TRAFF\_DIO\_032()

```
void TRAFF_DIO_032 ( )
```

Here is the call graph for this function:



### 3.25.2.33 TRAFF\_DIO\_033()

```
void TRAFF_DIO_033 ( )
```

Here is the call graph for this function:





### 3.25.2.34 TRAFF\_DIO\_034()

```
void TRAFF_DIO_034 ( )
```

Here is the call graph for this function:



### 3.25.2.35 TRAFF\_DIO\_035()

```
void TRAFF_DIO_035 ( )
```

Here is the call graph for this function:



## 3.26 Test\_Dio.h

[Go to the documentation of this file.](#)

```
1
2
3
4 #ifndef TEST_DIO_H_
5 #define TEST_DIO_H_
6
7
8 #define PORT_E 'E'
9
10 void TRAFF_DIO_001();
11 void TRAFF_DIO_002();
12 void TRAFF_DIO_003();
13 void TRAFF_DIO_004();
14 void TRAFF_DIO_005();
15 void TRAFF_DIO_006();
16 void TRAFF_DIO_007();
17 void TRAFF_DIO_008();
18 void TRAFF_DIO_009();
19 void TRAFF_DIO_010();
20 void TRAFF_DIO_011();
21 void TRAFF_DIO_012();
22 void TRAFF_DIO_013();
```

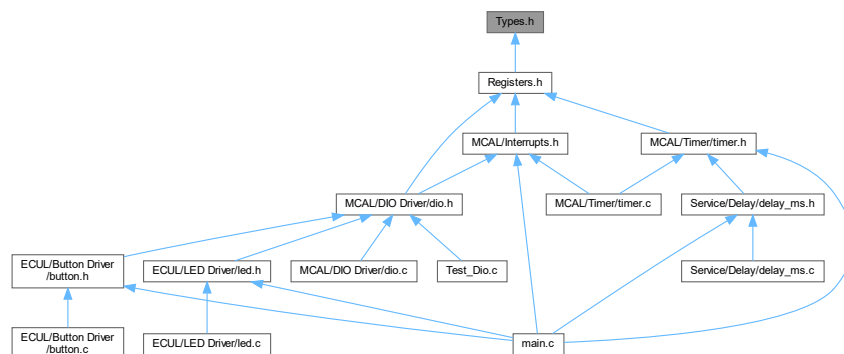
```

23 void TRAFF_DIO_014();
24 void TRAFF_DIO_015();
25 void TRAFF_DIO_016();
26 void TRAFF_DIO_017();
27 void TRAFF_DIO_018();
28 void TRAFF_DIO_019();
29 void TRAFF_DIO_020();
30 void TRAFF_DIO_021();
31 void TRAFF_DIO_022();
32 void TRAFF_DIO_023();
33 void TRAFF_DIO_024();
34 void TRAFF_DIO_025();
35 void TRAFF_DIO_026();
36 void TRAFF_DIO_027();
37 void TRAFF_DIO_028();
38 void TRAFF_DIO_029();
39 void TRAFF_DIO_030();
40 void TRAFF_DIO_031();
41 void TRAFF_DIO_032();
42 void TRAFF_DIO_033();
43 void TRAFF_DIO_034();
44 void TRAFF_DIO_035();
45
46 #endif /* INCFILE1_H_ */

```

## 3.27 Types.h File Reference

This graph shows which files directly or indirectly include this file:



## Macros

- `#define NULL 0` /\*\* Define NULL in the program\*/
- `#define TRUE 0xAA`  
Define the true Value.
- `#define FALSE 0x55`

## Typedefs

- `typedef enum Status Status`  
Enum showing the state of the function.
- `typedef unsigned char uint8_t`
- `typedef unsigned int uint16_t`

## Enumerations

- enum `Status` { `Ok`, `Not_ok` }

*Enum showing the state of the function.*

### 3.27.1 Macro Definition Documentation

#### 3.27.1.1 FALSE

```
#define FALSE 0x55
```

#### 3.27.1.2 NULL

```
#define NULL 0 /** Define NULL in the program*/
```

#### 3.27.1.3 TRUE

```
#define TRUE 0xAA
```

Define the true Value.

### 3.27.2 Typedef Documentation

#### 3.27.2.1 Status

```
typedef enum Status Status
```

Enum showing the state of the function.

#### 3.27.2.2 uint16\_t

```
typedef unsigned int uint16_t
```

### 3.27.2.3 uint8\_t

```
typedef unsigned char uint8_t
```

## 3.27.3 Enumeration Type Documentation

### 3.27.3.1 Status

```
enum Status
```

Enum showing the state of the function.

## Enumerator

Ok	
Not_ok	

## 3.28 Types.h

[Go to the documentation of this file.](#)

```
1 /*
2  * Types.h
3  *
4  * Created: 9/6/2022 10:19:47 PM
5  * Author: Moataz
6  */
7
8
9 #ifndef TYPES_H_
10 #define TYPES_H_
11
12
13 #define NULL 0
14 #define TRUE 0xAA
15 /**Define the False value*/
16 #define FALSE 0x55
17
18 typedef enum Status{
19     Ok,
20     Not_ok
21 }Status;
22
23
24 typedef unsigned char uint8_t;
25 typedef unsigned int uint16_t;
26
27
28 #endif /* TYPES_H_ */
```



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