## CANDrv

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# **Chapter 1**

# **Class Index**

## 1.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

CANPAGEHandler	
Class for safe handling of the CANPAGE register	Ę
mob_settings	
Settings for a MOB	6
MobConfigElement	
Configuration object for the FRMMan Settings	8

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# Chapter 2

# File Index

## 2.1 File List

Here is a list of all files with brief descriptions:

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File Index

## **Chapter 3**

## **Class Documentation**

## 3.1 CANPAGEHandler Class Reference

Class for safe handling of the CANPAGE register.

```
#include <CANDrv.h>
```

#### **Public Member Functions**

- CANPAGEHandler (uint8\_t mob\_nr)
   set CANPAGE to the supplied NR
- ∼CANPAGEHandler ()

recovers the previously saved CANPAGE

#### 3.1.1 Detailed Description

Class for safe handling of the CANPAGE register.

This class is initialized with the mob\_nr to switch to. The current CANPAGE is saved an will be restored after destruction of the context

#### 3.1.2 Constructor & Destructor Documentation

#### 3.1.2.1 CANPAGEHandler()

set CANPAGE to the supplied NR

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#### **Parameters**

mob⊷	the Number of the MOB to switch to
_nr	

#### 3.1.2.2 ~CANPAGEHandler()

```
CANPAGEHandler::~CANPAGEHandler ( )
```

recovers the previously saved CANPAGE

The documentation for this class was generated from the following files:

- CANDrv.h
- CANDrv.cpp

## 3.2 mob\_settings Struct Reference

Settings for a MOB.

```
#include <CANDrv.h>
```

#### **Public Attributes**

• uint16 t can id

CAN ID.

• uint16\_t can\_msk

CAN Mask.

• uint8 t ide

Extended Message Format.

• uint8\_t dlc

Data Length Coding.

• uint8\_t \* data

Pointer to the Data array.

## 3.2.1 Detailed Description

Settings for a MOB.

### 3.2.2 Member Data Documentation

```
3.2.2.1 can_id
```

uint16\_t mob\_settings::can\_id

## CAN ID.

Input for Transmisson.

Input or Output for Receiving. Depending on the CAN Mask.

3.2.2.2 can\_msk

uint16\_t mob\_settings::can\_msk

CAN Mask.

Mask of the CAN ID for RX.

Input for Receiving, Irrelevant for Transmitting<br/>
or>

The Can Message is filtered by a Acceptance filter according to this Mask.

This Element is bit coded. 0 means this bit in the CAN ID is not relevant for Acceptance. 1 means it is relevant.

## for example:

Configured CAN ID	Configured CAN MSK	Actual CAN ID	ACCEPTANCE
7E0	3FF	7E0	YES
7E0	3FF	7E8	NO
7E0	3F7	7E8	YES
7E0	000	ANY	YES

#### 3.2.2.3 data

uint8\_t\* mob\_settings::data

Pointer to the Data array.

The Data arry has to be already allocated.

3.2.2.4 dlc

uint8\_t mob\_settings::dlc

Data Length Coding.

Length of the Data. Output for Receiving. Input for Transmission

3.2.2.5 ide

uint8\_t mob\_settings::ide

Extended Message Format.

this element is set to 1 if the extended Message Format is used. Input for Transmitting and Receiving

The documentation for this struct was generated from the following file:

• CANDrv.h

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## 3.3 MobConfigElement Struct Reference

```
configuration object for the FRMMan Settings
```

```
#include <CANDrv.h>
```

#### **Public Attributes**

- mob\_purpose op
- mob\_settings ms
- void(\* f )(uint8\_t)
- uint32\_t timestamp
- void \* additionalData

#### 3.3.1 Detailed Description

configuration object for the FRMMan Settings

#### 3.3.2 Member Data Documentation

```
3.3.2.1 additionalData
```

```
void* MobConfigElement::additionalData
```

additional Data for usage in an custom ISR

```
3.3.2.2 f
```

```
void(* MobConfigElement::f) (uint8_t)
```

ISR routine

3.3.2.3 ms

```
mob_settings MobConfigElement::ms
```

settings struct

3.3.2.4 op

```
mob_purpose MobConfigElement::op
```

purpose of the MOB

3.3.2.5 timestamp

```
uint32_t MobConfigElement::timestamp
```

OUT: timestamp of the Last Interrupt

The documentation for this struct was generated from the following file:

• CANDrv.h

## **Chapter 4**

## **File Documentation**

## 4.1 CANDrv.cpp File Reference

```
CANDrv cpp file.
```

```
#include <avr/io.h>
#include "CANDrv.h"
#include "Arduino.h"
```

#### **Functions**

```
    uint8_t CANDrv_Set_bt (CanBaudrate baudrate)
    set the Timing Parameters for the CAN.
```

void CLEAR\_RXOK ()

Clears the interrupt FLAG.

void CANDrv\_ClearAll\_MOB (void)

advanced Function not needed for normal operation

uint8 t CANDrv Init (CanBaudrate baudrate)

Initialize the CAN Driver.

void getMOBsetup (mob\_settings \*ms)

advanced Function not needed for normal operation

void setupMOB (mob\_settings \*ms)

advanced Function not needed for normal operation

void receiveData\_generic (uint8\_t mob\_NR)

generic Receive funtion for an Interrupt Driven MOB.

void receiveData\_generic\_restart (uint8\_t mob\_NR)

generic Receive funtion for an Interrupt Driven MOB.

uint8\_t CANDrv\_FRMMan\_Init (MobConfigElement \*CAN\_Config)

Initialize the FRMMan.

• uint8\_t CANDrv\_FRMMan\_Send\_Msg (uint8\_t index)

sends a configured Message

- uint8\_t CANDrv\_FRMMan\_Get\_Msg (uint8\_t index, mob\_settings \*ms, uint8\_t iteration=0) get a received Can Message.
- uint8\_t CANDrv\_FRMMan\_Get\_Msg (uint8\_t index, mob\_settings \*ms)

get a received Can Message.mob\_status CANDrv\_FRMMan\_Get\_MSG\_State (uint8\_t index)

• ISR (CAN\_INT\_vect)

#### Variables

• MobConfigElement \* \_\_internal\_CAN\_Config

## 4.1.1 Detailed Description

CANDrv cpp file.

This File contains the Implementation of the CANDrv and the FRMMan

#### 4.1.2 Function Documentation

#### 4.1.2.1 CANDrv\_ClearAll\_MOB()

advanced Function not needed for normal operation

This function clear all MOB registers. This is used in INI.

#### 4.1.2.2 CANDrv\_FRMMan\_Get\_Msg() [1/2]

get a received Can Message.

This function reads a received Can Message from the internal Buffer.

It also retries to read if there were any Changes, because of an Interrupt, receiving a new Message. In this case the read operation is retried.

#### **!ONLY USED INTERNALLY!**

#### **Parameters**

index	the index of the mob to read
ms	OUTPUT Pointer to a message settings object, where the data is written.
iteration	Helper argument to limit the number of tries

#### Returns

1 on success. 0 in case of an error.

#### 4.1.2.3 CANDrv\_FRMMan\_Get\_Msg() [2/2]

```
CANDrv_FRMMan_Get_Msg (
```

```
uint8_t index,
mob_settings * ms )
```

get a received Can Message.

This function reads a received Can Message from the internal Buffer.

It also retries to read if there were any Changes, because of an Interrupt, receiving a new Message. In this case the read operation is retried.

#### **Parameters**

index	the index of the mob to read
ms	OUTPUT Pointer to a message settings object, where the data is written.

#### Returns

1 on success. 0 in case of an error.

#### 4.1.2.4 CANDrv\_FRMMan\_Get\_MSG\_State()

Initialize the FRMMan.

This function initializes the FRMMan with the given CAN\_Config.

#### Example configuration:

```
//Make sure all these variables are global an not in a scoped context, like a funtion.
uint8_t data_130[8];
uint8_t data_7e8[8];
uint8_t data_7e0[8];
MobConfigElement CAN_Config[] =
      \label{thm:continuous} $$\{TX_DATA_SW_DRIVEN, \{0x7e0,0x000,0,8, (uint8_t*)\&data_7e0\}\}, //This $$Messsage can be sented to the continuous sented t
              with CANDrv_FRMMan_Send_Msg(0);
      {RX_DATA_INTERRUPT_DRIVEN, {0x130,0x3FF,0,8, (uint8_t*)&data_130},&
            receiveData_generic_restart,0,0},//This Message will be received with an
               Interrupt. It will be directly enabled again
       {RX_DATA_INTERRUPT_DRIVEN, {0x7e8, 0x3FF, 0, 8, (uint8_t*) &data_7e8}, &
            receiveData_generic,0,0},//This Message will be received with an Interrupt. It will be
               only received once!
       {UNUSED},//unused MOBs
       {UNUSED},
      {UNUSED}
void setup() { data_7e0[0] = 0x02; //Initialize the Message to send. data_7e0[1] = 0x01;
data_7e0[2] = 0x05;
 data_{7e0[3]} = 0x33;
 data_{7e0[4]} = 0x44;
data_7e0[5] = 0x55;
data_{7e0[6]} = 0x66;
data_{7}e0[7] = 0x77;
CANDrv_Init(CAN_500k); //init CANDrv
CANDrv_FRMMan_Init(CAN_Config);//init FRMMan
\operatorname{sei}()\,;//\operatorname{enable} interrupts. This is neccessary for the Interrupt driven receives
```

#### **Parameters**

CAN Confia	The CAN_Config to use. For examples see funtion description.

#### Returns

1 on success. 0 in case of an error.

#### 4.1.2.6 CANDrv\_FRMMan\_Send\_Msg()

sends a configured Message

This function sends a predefined Message.

#### **Parameters**

index	the index of the Message to send
-------	----------------------------------

#### Returns

1 on success. 0 in case of an error.

## 4.1.2.7 CANDrv\_Init()

Initialize the CAN Driver.

#### **Parameters**

baudrate	the baudrate to set
Daddarate	lilo baddiato to sot

#### Returns

1 on success. 0 in case of an error.

### 4.1.2.8 CANDrv\_Set\_bt()

set the Timing Parameters for the CAN.

the Values of the Registers CANBT1-3 are also defined in this file.

!ONLY USED INTERNALLY!

#### **Parameters**

baudrate the baudrate to se	t.
-----------------------------	----

#### Returns

1 on success. 0 in case of an error.

#### 4.1.2.9 CLEAR\_RXOK()

```
void CLEAR_RXOK ( ) [inline]
```

Clears the interrupt FLAG.

#### 4.1.2.10 getMOBsetup()

advanced Function not needed for normal operation

This function reads the Settings from the currently selected MOB. To select a MOB see CANPAGEHandler

#### See also

**CANPAGEHandler** 

#### **Parameters**

ms pointer to the MOB settings

## 4.1.2.11 ISR()

#### 4.1.2.12 receiveData\_generic()

generic Receive funtion for an Interrupt Driven MOB.

This function only receives this Message once!

#### **Parameters**

mob_NR the MOB Number given by the ISR
--

#### 4.1.2.13 receiveData\_generic\_restart()

generic Receive funtion for an Interrupt Driven MOB.

This function will activate the Interrupt again.

#### **Parameters**

mob_	NR	the MOB Number given by the ISR
------	----	---------------------------------

#### 4.1.2.14 setupMOB()

```
setupMOB (
    mob_settings * ms )
```

advanced Function not needed for normal operation

This function writes the given Settings to the currently selected MOB. To select a MOB see CANPAGEHandler

See also

CANPAGEHandler

#### **Parameters**

```
ms pointer to the MOB settings
```

#### 4.1.3 Variable Documentation

```
4.1.3.1 __internal_CAN_Config
```

```
MobConfigElement* __internal_CAN_Config
```

## 4.2 CANDrv.h File Reference

CANDrv header File.

#### **Classes**

· struct mob settings

Settings for a MOB.

• struct MobConfigElement

configuration object for the FRMMan Settings

• class CANPAGEHandler

Class for safe handling of the CANPAGE register.

#### **Enumerations**

enum CanBaudrate { CAN\_500k, CAN\_800k }

Baudrate Enumerator for the Baudrate.

enum mob\_operation { TX\_DATA = 0x01, RX\_DATA = 0x02, DISABLED = 0x00 }

MOB Operation Enumerator for the operation while manually using a MOB.

• enum mob\_purpose {

```
TX_DATA_SW_DRIVEN = 0x10, RX_DATA_SW_DRIVEN = 0x20, MULTIPURPOSE = 0x30, RX_DATA_↔ INTERRUPT DRIVEN = 0x62,
```

RX\_DATA\_INTERRUPT\_DRIVEN\_INACTIVE = 0x60, TX\_DATA\_INTERRUPT\_ACTIVE = 0x50, UNUSED = 0x00 }

MOB Purpose Enumerator for the Purpose of the MOB when configuring the FRMMan.

enum mob status {

```
TX_PENDING = 0x03, TX_OK = 0x05, RX_PENDING = 0x02, RX_OK = 0x04, RX_ERROR = 0xFE, TX_ERROR = 0xFF, IDLE = 0x00 }
```

MOB Status Enumerator for the Status of the MOB.

#### **Functions**

• uint8\_t CANDrv\_Init (CanBaudrate baudrate)

Initialize the CAN Driver.

uint8\_t CANDrv\_FRMMan\_Get\_Msg (uint8\_t index, mob\_settings \*ms)

get a received Can Message.

- mob\_status CANDrv\_FRMMan\_Get\_MSG\_State (uint8\_t index)
- uint8\_t CANDrv\_FRMMan\_Send\_Msg (uint8\_t index)

sends a configured Message

uint8\_t CANDrv\_FRMMan\_Init (MobConfigElement \*CAN\_Config)

Initialize the FRMMan.

• void receiveData\_generic (uint8\_t mob\_NR)

generic Receive funtion for an Interrupt Driven MOB.

void receiveData generic restart (uint8 t mob NR)

generic Receive funtion for an Interrupt Driven MOB.

void CANDrv\_ClearAll\_MOB (void)

advanced Function not needed for normal operation

void getMOBsetup (mob\_settings \*ms)

advanced Function not needed for normal operation

void setMOB\_Operation (mob\_operation mo)

set the Operation of the current MOB

## 4.2.1 Detailed Description

CANDrv header File.

This File describes the Interface of the CANDrv and the FRMMan

## 4.2.2 Enumeration Type Documentation

#### 4.2.2.1 CanBaudrate

enum CanBaudrate

Baudrate Enumerator for the Baudrate.

#### Enumerator

CAN_500k	500 Kbaud
CAN_800k	800 Kbaud

#### 4.2.2.2 mob\_operation

enum mob\_operation

MOB Operation Enumerator for the operation while manually using a MOB.

#### Enumerator

TX_DATA	Transmit DATA
RX_DATA	Receive DATA
DISABLED	DISABLED

## 4.2.2.3 mob\_purpose

 $\verb"enum mob_purpose"$ 

MOB Purpose Enumerator for the Purpose of the MOB when configuring the FRMMan.

#### Enumerator

TX_DATA_SW_DRIVEN	TX triggered by SW
RX_DATA_SW_DRIVEN	RX triggered by SW
MULTIPURPOSE	RX and TX triggered by SW
RX_DATA_INTERRUPT_DRIVEN	RX triggered by Interrupt. Automatically activated at Startup
RX_DATA_INTERRUPT_DRIVEN_INACTIVE	RX triggered by Interrupt. Automatically deactivated at Startup
TX_DATA_INTERRUPT_ACTIVE	TX triggered by SW. Will cause an Interrupt on completion
UNUSED	MOB is unused

#### 4.2.2.4 mob\_status

```
enum mob_status
```

MOB Status Enumerator for the Status of the MOB.

#### Enumerator

TX_PENDING	TX PENDING
TX_OK	TX SUCCESSFULL
RX_PENDING	RX PENDING
RX_OK	RX SUCCESSFULL
RX_ERROR	ERROR
TX_ERROR	ERROR
IDLE	MOB is unused

#### 4.2.3 Function Documentation

#### 4.2.3.1 CANDrv\_ClearAll\_MOB()

advanced Function not needed for normal operation

This function clear all MOB registers. This is used in INI.

## 4.2.3.2 CANDrv\_FRMMan\_Get\_Msg()

get a received Can Message.

This function reads a received Can Message from the internal Buffer.

It also retries to read if there were any Changes, because of an Interrupt, receiving a new Message. In this case the read operation is retried.

#### **Parameters**

index	the index of the mob to read
ms	OUTPUT Pointer to a message settings object, where the data is written.

#### Returns

1 on success. 0 in case of an error.

#### 4.2.3.3 CANDrv\_FRMMan\_Get\_MSG\_State()

Initialize the FRMMan.

This function initializes the FRMMan with the given CAN\_Config.

Example configuration:

```
//Make sure all these variables are global an not in a scoped context, like a funtion.
  uint8_t data_130[8];
 uint8_t data_7e8[8];
uint8_t data_7e0[8];
 MobConfigElement CAN_Config[] =
             \{TX\_DATA\_SW\_DRIVEN, \{0x7e0, 0x000, 0, 8, (uint8_t*)&data_7e0\}\}, //This Messsage can be sent the sent that the sent the sent that the sent the sent that the sent that the sent the sent that the sent the sent that the sent that the sent the sent that the sent the sent that the sent the sen
                              with CANDrv_FRMMan_Send_Msg(0);
              \{ \texttt{RX\_DATA\_INTERRUPT\_DRIVEN,} \{ \texttt{0x130,0x3FF,0,8,(uint8\_t*)\&data\_130} \}, \& \texttt{0x130,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3FF,0,0x3F
                         \begin{array}{c} \textbf{receiveData\_generic\_restart,0,0},//\text{This Message will be received with an} \\ \textbf{Interrupt. It will be directly enabled again} \end{array} 
             {RX_DATA_INTERRUPT_DRIVEN, {0x7e8, 0x3FF, 0, 8, (uint8_t*) &data_7e8}, &
                        receiveData_generic,0,0},//This Message will be received with an Interrupt. It will be
                              only received once!
             {UNUSED},//unused MOBs
             {UNUSED},
             {UNUSED}
 void setup() { data_7e0[0] = 0x02; //Initialize the Message to send. data_7e0[1] = 0x01;
  data_7e0[2] = 0x05;
  data_7e0[3] = 0x33;
  data_7e0[4] = 0x44;
  data_{7e0[5]} = 0x55;
data_Teo[6] = 0x66;
data_Teo[7] = 0x77;
CANDrv_Init(CAN_500k); //init CANDrv
CANDrv_FRMMan_Init(CAN_Config);//init FRMMan
 sei();//enable interrupts. This is neccessary for the Interrupt driven receives
```

### Parameters

CAN\_Config The CAN\_Config to use. For examples see funtion description.

#### Returns

1 on success. 0 in case of an error.

## 4.2.3.5 CANDrv\_FRMMan\_Send\_Msg()

sends a configured Message

This function sends a predefined Message.

#### **Parameters**

index	the index of the Message to send
-------	----------------------------------

#### Returns

1 on success. 0 in case of an error.

#### 4.2.3.6 CANDrv\_Init()

Initialize the CAN Driver.

#### **Parameters**

baudrate the baudrate to set
------------------------------

#### Returns

1 on success. 0 in case of an error.

#### 4.2.3.7 getMOBsetup()

advanced Function not needed for normal operation

This function reads the Settings from the currently selected MOB. To select a MOB see CANPAGEHandler

#### See also

**CANPAGEHandler** 

#### **Parameters**

ms pointer to the MOB settings

#### 4.2.3.8 receiveData\_generic()

```
void receiveData_generic ( \label{eq:condition} \mbox{uint8\_t} \ mob\_NR \ )
```

generic Receive funtion for an Interrupt Driven MOB.

This function only receives this Message once!

#### **Parameters**

mob_NR	the MOB Number given by the ISR
--------	---------------------------------

#### 4.2.3.9 receiveData\_generic\_restart()

generic Receive funtion for an Interrupt Driven MOB.

This function will activate the Interrupt again.

#### **Parameters**

mob_NR	the MOB Number given by the ISR
--------	---------------------------------

#### 4.2.3.10 setMOB\_Operation()

```
setMOB_Operation (
          mob_operation mo ) [inline]
```

set the Operation of the current MOB

This function sets the Operation of the currently selected MOB To select a MOB see CANPAGEHandler

#### See also

CANPAGEHandler

#### **Parameters**

mo the operation mode to set the MOB to

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