

DELGEN

X-Graph Software Module

xgDMX512 Users Manual

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1 Welcome

1.1 Introduction

This X-Graph software modules includes a library to manages multiple channel DMX512 reception and transmission.

1.2 How This Book Is Organized

You can find following chapters in it:

Chapter 1 contains a view on all the information in this book.

Chapter 2 gives you all info available on the DMX512 library.

1.3 More Questions

If you have questions while using this X-Graph software module, check first if the information is available in this book. If you cannot find the answer check the information and forum on the X-graph website (www.x-graph.be). Finally you can also contact your local distributor or the X-Graph technical support by e-mail (techsup@x-graph.be).

This manual includes all available documentation on this X-Graph software module. It is strongly advised to download and read documentation on the Rabbit processor available from the Rabbit Semiconductor (www.rabbitsemiconductor.com) website. This manual is complimentary to the documentation found on these websites.

2 DMX512

2.1.1 DMX512

This library manages multiple channel DMX512 reception and transmission. It uses an interrupt driven packet transmitter/receiver function and maintains the 250kbaud speed requirement on all 6 serial channels simultaneous.

Most X-Graph modules can be equipped with one or more RS485 drivers. Each driver can be connected to a DMX512 expansion pcb. Additional RS485 channels can be used by using a plug-in boards and custom X-Graph modules (on which for example the standard dual-RS232C port is removed). Note that not all six Rabbit serial ports are available for RS485 driver expansion. Most X-Graph modules use two serial ports for internal hardware management (SPI bus, programming port). Contact DELGEN if you need additional DMX512 ports.

2.1.1.1 DMX Usage

A DMX512 channel uses a RS485 driver at 250kbaud. Data, organized in packets, is transmitted continuously. A specific start marker is used to indicate the start of package. The idle time between two package is configurable.

The X-Graph DMX512 library uses a set of macro's to define the maximum packet length and idle time. When a channel is enabled, the actual used packet length and idle time are software selectable (function parameters). But these cant be larger then the maxima set by the macros.

For each channel the library allocates a root memory communication buffer. Due to the interrupt routine logic this buffer is larger then the actual packet length. Also the buffer is of the 'unsigned int' type.

The buffers are directly accessible by the user program:

```
PortC: iDMXPortCBuffer[]
PortD: iDMXPortDBuffer[]
PortE: iDMXPortEBuffer[]
PortF: iDMXPortFBuffer[]
```

A user program should only write char data to the buffer (i.e. Within the range 0 to 255). Never write data words larger the 255 to the buffer because this will make the interrupt routine fail.

A XG5000 DMX port can either transmit or receive. As on all RS485 based protocols, there is only one transmitter and many receivers on a DMX512 bus. Macro's are available to include either the transmit, receive or both interrupt routines for each used channel. These macros reduce the code space needed for the DMX library.

The EnableDmX512() function is used to open a X-Graph DMX port as either transmit or receive. A port can be swapped from transmitter to receiver if needed.

For a transmit channel the first DMX_CHANNEL_x_MAX_BUFFER bytes of each buffer are the data buffer.

For a receive channel the first 4 bytes of the buffer are a time marker (i.e. A unsigned long copy of MS_TIMER). The remaining bytes contain the received data.

An example:

```
#define DMX_PORTE // Enable RabbitSerial Port E for DMX operation
#define DMX_PORTF // idem for Port F
#define DMX_PORTE_TXD // Include only the transmit irq routine for PortE
#define DMX_PORTF_RXD // Include only the receive irq routine for PortF
```

```
// Open Port E for transmitting with 16 byte buffer and 5 bytes idle time between packets
EnableDMX512(DMX_CHANNEL_E, 16, 0, 5);
// Open PortF for receiving
EnableDMX512(DMX_CHANNEL_F, 0, 1, 2);
// Now just put data in the DMX buffer, the transmitter is already active
iDMXPortEBuffer[3] = 0x5e;
// You can read the receive buffer random and check the time tag
iTimePacketWasReceived = (unsigned long)iDMXPortFBuffer[0];
if (iDMXPortFBuffer[3] == 0x3e) ....
```

2.1.1.2 DMX Configuration Macro's

Use the following defines to enable DMX512 support:

- `DMX_PORTC` Enable DMX512 on Serial Port C (standard RS232C TXD/RXD on XG5000)
- `DMX_PORTD` Enable DMX512 on Serial Port D (standard RS232C CTS/RTS on XG5000)
- `DMX_PORTE` Enable DMX512 on Serial Port E (RS485 B on XG5000)
- `DMX_PORTF` Enable DMX512 on Serial Port F (RS485 A on XG5000)

The defines to configure the DE lines of both XG5000 RS485 ports are included in XGRAPH.LIB. If you need to use PortC and/or PortD (XG5000) you will also require an additional DE line for your RS485 port driver. The library needs a macro for this:

- `DMX_PORTC_DE_HIGH` A macro to set the DE line high
- `DMX_PORTC_DE_LOW` idem for low
- `DMX_PORTD_DE_HIGH` idem
- `DMX_PORTD_DE_LOW` Idem

In most DMX512 configurations you will only need either a transmitter or receiver on a certain channel. This reduces the interrupt overhead and used code space. The following macro's are used to enable transmitter and or receiver interrupt routines. The `EnableDMX512()` function is used to actually enable a channel for txd or rxd.

- `DMX_PORTC_TXD` Enable transmitter of Serial Port C
- `DMX_PORTC_RXD` Enable receiver of Serial Port C
- `DMX_PORTD_TXD` Enable transmitter of Serial Port D
- `DMX_PORTD_RXD` Enable receiver of Serial Port D
- `DMX_PORTE_TXD` Enable transmitter of Serial Port E
- `DMX_PORTE_RXD` Enable receiver of Serial Port E
- `DMX_PORTF_TXD` Enable transmitter of Serial Port F
- `DMX_PORTF_RXD` Enable receiver of Serial Port F

The `DMX_CHANNEL_x_MAX_BUFFER` macros define the maximum length of the DMX512 root memory buffers. If this macro is not defined the default value is 512.

The `DMX_CHANNEL_x_IDLE_TIME` macros define the maximum length of the idle time. If this macro is not defined the default value is 2. The allowed range is 2 until 255.

For each enabled DMX port a buffer of type 'unsigned int' in root data memory is declared. The total root data memory requirement for each channel can be calculated with the following formula:

$$(DMX_CHANNEL_x_MAX_BUFFER + DMX_CHANNEL_x_IDLE_TIME + 8) * 2$$

The DMX512 baudrate should be 250.000 baud. This can not be obtained with all Rabbit processor cpu frequencies. The lib automatically sets the best possible baudrate. This automatic calculated baudrate can be overwritten by using the following macro:

`DMX_PRESCALER` xxxx (xxx = the prescaler to be used for all serial DMX ports)

2.1.1.3 DMX Functions

int InitDMX512(void);

Initializes the hardware for DMX512 support.
This function only needs to be called once.

PARAMETER

None

RETURN VALUE

0: init OK

-1: init failed

int EnableDMX512(char iChannel, unsigned int iNr, char iRxd, char iIdleTime);

Enables a DMX512 serial port.

PARAMETER

iChannel:

2 = Port C

3 = Port D

4 = Port E

5 = Port F

iNr: number of bytes to transmit for this channel (range is 1 up to
DMX_CHANNEL_x_MAX_BUFFER)

iRxd:

0 = enable the transmitter for this channel

1 = enable the receiver for this channel

iIdleTime: nr of bytes of idle time between two blocks (range is 2 up to
DMX_CHANNEL_x_IDLE_TIME)

RETURN VALUE

0: transmitter started

-1: illegal channel number

-2: iNr must be minimum 2

-3: iNr is larger then the buffer

-4: channel already active, first disable the channel

-5: receiver not enabled by macro

-6: transmitter not enabled by macro

-7: iRxd must be either 1 or 0

-8: invalid Idle Time

int DisableDMX512(char iChannel);

Disables a DMX512 serial port after the current packet is completely transmitted.

PARAMETER

2 = Port C

3 = Port D

4 = Port E

5 = Port F

RETURN VALUE

0: transmitter busy stopping, receiver stopped

-1: illegal channel number

-2: buffer corrupted, channel is forced off

-3: internal error

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1.0

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