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Henne’s Sites

AN113: DMX Transmission with AVRs

Introduction

In this application note the transmission of DMX signals with AVR controllers is described. There is an Assembler- and a C-Version of the used state machines. This application note was written for the DMX-Transceiver but should be portable to most AVRs.

Terms of Use

You can use the state machines under the terms of the gnu general puplic license (GPL). If this causes problems, please contact the author.

DMX 512

DMX512 is a unidirectional differential serial protocol based on the physical layer of RS485. The baudrate is 250kbit/sec. There are one master and up to 32 slaves in one bus. The number of slaves can be increased by using splitters/boosters. One universe contains up to 512 frames (channels). The transmission is initialized by a break (LO level) of >88µs, a mark after break (MAB, HI level) of >8µs and a start byte (also called start code) which is usually 0. A frame is made of 1start bit, 8data bits and 2stop bits (8n2).

Description of the code

The code consists of the initialization the USART and an ISR:

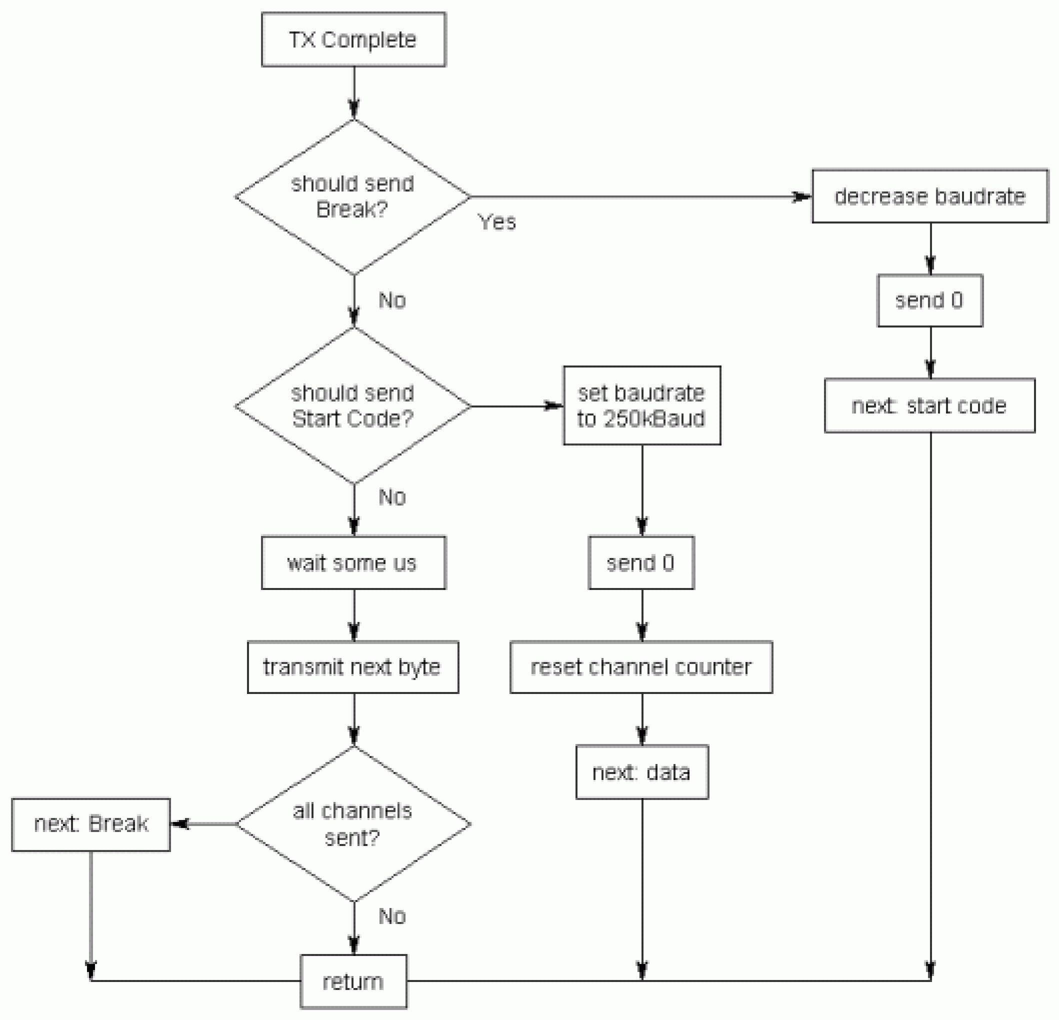
In the "USART Transmission Complete" routine we check at first if a break has to be sent. In this case the baud rate is decreased and a null transmitted. Receivers will recognize that as a break with a length of >100µs and a MAB of >8µs.

To transmit the start code, the baud rate must be set to 250kBit/s after the break has finished. Then another null is sent and channel counter reset.

After the start code is sent, the channel values are transmitted.

If the universe is completed, we start again with a break.

Some receivers need an inter-byte gap for buffering the serial data (not the transceiver!). Please keep that gap as short as possible to achieve a high refresh rate. Many receivers need universes with >50ch (otherwise the refresh rate becomes too high). If you need less channels: Please transmit some zeros…



Assembler-Version

The code was written with AVR Studio 4.13.

```
#define DMX_FIELD          0x60        //base address of DMX array
#define DMX_CHANNELS       50          //no. of channels
#define F_OSC              8000        //oscillator freq. in kHz (typical 8MHz or 16MHz)
```

DMX_FIELD is the first channel in the transmit array located in the SRAM. The SRAM starts with 0x60.
DMX_CHANNELS is the amount of DMX channels of your universe.
F_OSC is the CPU frequency in kHz.

The USART is initialized for DMX transmission and the transmit array is cleared by calling “init_dmx”.

With „send_byte“ as USART transmit complete ISR the DMX data is sent.

The library should be included at the end of the entry file (but still before tables…).

C-Version

The code was written with AVR Studio 4.13 and WinAVR-20060125.

```
#define F_OSC                    8000               //oscillator freq. in kHz (typical 8MHz or 16MHz)
volatile uint8_t DmxField[50];                      //array of DMX vals
```

F_OSC is the CPU frequency in kHz.
DmxField is the DMX universe.

The USART is initialized for DMX transmission and the Universe is cleared by calling "init_DMX()".

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