Two-way system protocol

1. Aims

To help users develop their own program to make full use of FrSky's two-way system.

2. Hardware definition

Telemetry Pins:

Port 1: 0~3.3V voltage, value: 0x00~0xff.

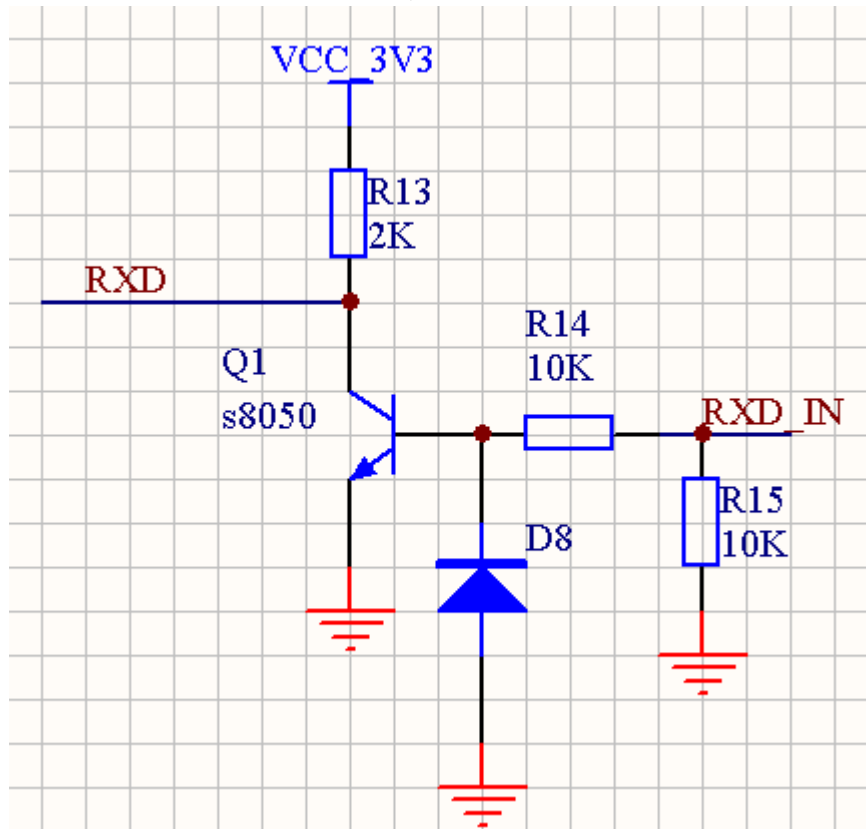Port 2: 0~3.3V voltage, value: 0x00~0xff.

Port 3: COM port RX pin, RS232 level.

Serial COM setting: **9600bp**s, 8bit, No parity, 1 stopping bit.

Rxd_in	5V	GND
AD0	3.3V	GND
AD1	3.3V	GND

Interfacing RS232 on Rx:

This diagram is the RS232 RXD pin connection of the Rx, it is a simple RS232-to-TTL level shifter with inverter. You can modify the PCB for direct TTL level connection.

2.1. Host end

Serial COM RS232 level, setting: **9600bps**, 8bit, No parity, 1 stopping bit.
Build in error free protocol, there is no need for error correction by user.

Rxd_in
Txd_out
+5V
GND

3. Frame protocol

3.1. Host end

- 11 bytes frame started and ended with 0x7E, with byte stuff.
- Byte stuffing method:

  Output

  Byte in frame has value 0x7E is changed into 2 bytes: 0x7D 0x5E

  Byte in frame has value 0x7D is changed into 2 bytes: 0x7D 0x5D

  Input:

  When byte 0x7D is received, discard this byte, and the next byte is XORed with 0x20;

Input for setting alarm threshold

Head	PRIM	Threshold Value	Greater 1:greater than 0: less than	Alarm level 0: disable 1: Yellow 2: Orange 3: Red	5 bytes 00	End Byte	Answered with
0x7E	0xFC	Analog 1	1/0			0x7E	The same frame
0x7E	0xFB	Analog 1	1/0			0x7E	The same frame
0x7E	0xFA	Analog 2	1/0			0x7E	The same frame
0x7E	0xF9	Analog 2	1/0			0x7E	The same frame

3.1.1. Input for request all available threshold setting

0x7E	0xF8	00	00	00	5bytes 00	0x7E	All threshold setting frames

3.1.2. Output for available alarm thresholds

head	PRIM	Threshold Value for	Greater 1:greater than 0: less than	Alarm level 0: disable 1: Yellow 2: Orange 3: Red	5 bytes 00	End Byte	
0x7E	0xFC	Analog 1	1/0			0x7E	
0x7E	0xFB	Analog 1	1/0			0x7E	
0x7E	0xFA	Analog 2	1/0			0x7E	
0x7E	0xF9	Analog 2	1/0			0x7E	

3.1.3. Output for remote voltage and link quality

Head	PRIM	Analog value for	Analog value for	Link quality	5 bytes 00	End Byte	
0x7E	0xFE	port 1	Port 2	Link quality		0x7E	

3.1.4. User data

Head	PRIM	Length of valid bytes in frame	Not used	User bytes	User bytes	End Byte	
0x7E	0xFD	Length of valid bytes	Not used	byte1	byte2 to byte6	0x7E	

3.2. Remote end

Just pure user bytes.

4. Changes history

4.1. Frame format

From

0xFF 0xF* 0x** 0x** 0x** 0x** 0x** 0x** 0x** 0x**

ten bytes frame to

0x7E 0xF* 0x** 0x** 0x** 0x** 0x** 0x** 0x** 0x** 0x7E

11 bytes frame with "byte stuffing".

4.2. Speed

Serial COM port speed from 4800bps to 9600bps, corresponding to modern GPS's default

setting.

Notice: Pure data throughput should NOT exceed 1200bps, MAY experience BYTE DISCARD.

4.3. Alarm setting and responding

Alarm level code changed:

From: 0 (Red); 1 (Orange); 2 (yellow)

To: 0: (disable); 1 (yellow); 2 (Orange); 3 (Red)