

Tiny Frame_Interface

Liquid_level

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1. Application Projects

For different applications, all messages related to TF frames are listed for the user's reference and parsing, and the message classes and message data bits appearing in the document are equipped in the corresponding actual projects.

1.1 Liquid Level Project

Message Type: Report Level Program Test Results 0x0A0C

The message type is 0x0A0C and only supports unidirectional data transfer mode.

The radar sends data to the host computer:					
Specification	Bytes	Basic type	Frame structure	Example frame	Frame Mean
SOF	1 byte	uint8	Start frame	01	Used to report distance results.
ID	2 byte	uint16	F r a m e I D	00 00	
LEN	2 byte	uint16	Data frame length	4	
TYPE	2 byte	uint16	Frame type	0A 0C	
HEAD_CKSUM	1 byte	uint8	Checksum of header	A8	
DATA	4 byte	Float32	[distance]	AF 64 8A 40	
DATA_CKSUM	1 byte	uint8	Checksum of data	FE	

The following are the meanings corresponding to each DATA bit:

- [distance]: Target distance.

Convert to float: e.g. [distance] bits are 0x66, 0x66, 0xA2, 0x41, first put them into uint32 bit shaping, because of the small end-order of the Data bits in the TF frame, the value is 0x41A26666, and then do a strong conversion to float type, the final result is: 20.3.

```
1. int main(void)
2. {
3.     unsigned int param = 0x41A26666;
4.     float *res = (float *)param;
5.
6.
7.     printf("data: %f\n", *res);
8.     return 0;
```

Message type: Uploading data after the first FFT 0x2D09

The message type is 0x2D09 and only supports unidirectional data transfer mode.

The radar sends data to the host computer:					
Specification	Bytes	Basic type	Frame structure	Example frame	Frame Mean
SOF	1 byte	uint8	Start frame	01	Send the data after the first FFT to the host computer.
ID	2 byte	uint16	F r a m e I D	00 00	
LEN	2 byte	uint16	Data frame length	4	
TYPE	2 byte	uint16	Frame type	2D 09	
HEAD_CKSUM	1 byte	uint8	Checksum of header	\	
DATA	4 byte	int32	[ADC1 point1 I]	\	
DATA	4 byte	int32	[ADC1 point1 Q]	\	
.....	
DATA	4 byte	int32	[ADC1 point1024 I]	\	
DATA	4 byte	int32	[ADC1 point1024 Q]	\	
DATA_CKSUM	1 byte	uint8	Checksum of data	\	

The following are the meanings of the DATA bits:

- [ADC1 point1 I]: The real part of the first point after the FFT.
- [ADC1 point1 Q]: The imaginary part of the first point after the FFT.

Convert to int32: e.g. [ADC1 point1 I] bits 0x66, 0x66, 0xA2, 0x41, first put into uint32 bit shaping, due to the small end sequence of Data bits in the TF frame, the value is 0x41A26666, and then do a float type strong conversion.

```
9. int main(void)
10. {
11.     unsigned int param = 0x41A26666;
12.     float *res = (float *)param;
13.
14.     printf("data: %f\n", *res);
15.     return 0;
16. }
```

If we need to plot the spectrum with decibels, we can calculate it as follows: Re corresponds to I, Im corresponds to Q.

于是对fft计算的复数结果，其实数和虚数对应如下：

名称	计算公式
幅度(Magnitude)	$\sqrt{\text{Re}^2 + \text{Im}^2}$
幅值(Amplitude)	$i = \left(0, \frac{n}{2}\right), A = \frac{\sqrt{\text{Re}^2 + \text{Im}^2}}{n}; \text{otherwise}, A = \frac{2\sqrt{\text{Re}^2 + \text{Im}^2}}{n}$
dB	$20\log(\text{Amplitude})$

According to the formula for calculating the amplitude: when the index (0~1023) is the first (0) point and the number of sampling points (N:1024)/2 points, divide the amplitude by (N), and divide the other points by (N/2).

Finally, take 20log(A) and figure it out in DB.

Bring in the index (0~1023) with the largest dB value: (index-1)* 0.04m = get the rough target distance.

2. Programming Interface

2.1 Encoding TF messages

```
void tinyFrameTx(TF_TYPE type, uint8 *data, TF_LEN len);
```

Where type is the type of data to be sent, uint16 type, e.g. personnel detection data results are reported, data type is 0x0A10. see 4.2.1.6 for details.

UInt8* data is the address of the data to be sent.

Len is the length of the sent data, uint16 type.

2.2 Decoding TF messages

```
TinyFrameRx tinyFrameRx(void);
```

After successfully receiving a message, the received data is returned to a variable of type TinyFrameRx.

2.3 Example code

If you want a demo for parsing TF frame data (including C language demo and Python language demo under Linux environment and Keil μ Vision5 environment), you can get it directly from the sales.



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