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Delta-2A Communication Interface Agreement

[Delta-2a]

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table of Contents

One.Radar communication profile

Delta-2a laser radar is communicated with external equipment through UART TTL level, only support single work

Communication (ie laser radar active data frames to external devices), external devices only need to be effective from data frames

The data can be, no need to respond, all of the data in the communication frame is 16-en-format data.

Radar is a rotation measurement for one week, scanned to get information on a uniform distribution point around a circle (point angle and distance

from).SDK is to receive parsing data to get information about each lap point.A circle 360 ° is divided into 16

Frame Report Scan Information (see the following command list) frame, so each frame initial angle of 16 frames is obtained

Is 0 ° (zero - location specification), 22.5 °, 45 °, 67.5 °, 90 ° ... 270 °, 292.5 °, 315,

337.5 °, 360 °.16 frame data is added to a complete circle, and the total number of points in a circle = 16 * points per frame;

The total number of points per frame can be obtained according to the scan information frame, the number of distances can be obtained (distance number = total points).Per frame

Information (angle and distance) of data points: The distance of the nth point in one frame is the N-distance value in the scanned information frame,

An angle corresponding to the Nth distance distance from the frame = this frame start angle + (n-1) * 22.5 / (total per frame

Points), such a frame information (angle and distance) has.

According to the communication protocol defined in this paper, the communication data is parsed, and the real-time measurement information and equipment can be parsed.

Health status information.

two.Communication frame structure

Communication frame consists of frame head, frame length, frame type, command word, parameter length, parameter, check code,

Mainly used for laser radar actively upload measurement information, fault information, etc. to external hosts, the host is required to

The valid data is extracted in the communication frame uploaded by the radar, and does not need to respond.

The command frame format is as follows:

Frame header	length	Protocol version	Frame type	Command word	parameter length	parameter	Check code

Frame: The frame header field occupies 1 byte, fixed to 0xAA.

Frame length: The frame length field occupies 2Byte, the calculation of the frame length begins with the frame head, to the front byte of the check code,

High position before, low.

Protocol version: Address code field occupies 1BYTE, default is 0x00.

Frame Type: The frame type field takes up 1BYTE, fixed to 0x61.

Command Word: Command word for 1byte, is identifier of different commands.

Parameter length: Parameter length accounts for 2BYTE, is the length of the valid data in the data frame, the high position is before, the low is behind.

Parameters: The parameter field is the valid data of the command.

Cat code: The check code field is a 16-bit accumulation and, accounting for two bytes, the high position is before, and the low is behind.

Calculate: From the frame head to the check code before the verification code is tired.

Command word list:

Command	word description	Parameter length	Parameter Description
0xAD	Measuring information	(3N + 5) BYTES	1BYTES: Radar speed value, 8 bits no symbol, minimum resolution is 0.05r / s (ie, the speed value is 1, the corresponding speed is 0.05r / s) 1 ~ 2Bytes: zero offset, 16 bits have a number of symbols, high in front, After the low level, the minimum resolution is 0.01 ° (zero offset: radar Try information, no use after analysis) 3 ~ 4Bytes: This data frame starts angle value, 16 bits no symbol, high in front, low 5 BYTES: The signal value corresponding to the distance value, 8 bits no sign (letter

			Value: Radar debugging information, no use after analysis) 6?7Bytes? Distance value 1,16 bits no sign number, high in front, low 8Bytes? The signal value corresponding to the distance value 2, 8 bits no sign (signal value: thunder Decoction information, no use after analysis) 9?10Bytes? Distance value 2,16 bits no sign number, high in front, low . 3N + 2Bytes: Signal value corresponding to the value n, 8 bits unsigned Number (signal value: radar debugging information, no use after analysis) 3N + 3 ~ 3N + 4BYTES: Distance value n, 16 bits no symbol, high in front, low Remarks: 1. Angle value range: 0 ~ 36000 2. Angle resolution: 0.01 ° (ie the angle value is 1, the corresponding angle is 0.01 °) Distance resolution 0.25mm (ie the distance value is 1, corresponding to the actual distance Is 0.25mm) 3. Angle calculation:

			Example: Calculate the distance N (N to 1 to n, n this frame distance points): N = (parameter length - 5) / 3 From the angle of N = start angle value + 22.5 ° * (n - 1) / n
0xAE	Equipment health information	1Byte	Equipment speed failure The speed value, 8 BITS no symbol, minimum resolution is 0.05r / s

three.Calculation code calculation

This Agreement communication frame patterns use 16-bit accumulation and, below is the routine of the calculation of the check code, only

for reference.

```
/ / ============================================

==========================================================================================================

// Calculation code calculation

// * start_byte: Start byte

// Num_bytes: The length of the data being calculated

// Return Value: 16-bit check code

/ / ============================================

==========================================================================================================

u16 CRC16(u8 *Start_Byte,u16 Num_Bytes)

{
```

```
    u16 Checksum = 0;

    while (Num_Bytes--)

    {/ / Calculate CRC

        Checksum += *Start_Byte++;

    }

    return Checksum;

}
```

four.Communication frame instance analysis

0. Resolution in the protocol: actual measurement data = Communication value * resolution

Actual speed = communication medium speed value * resolution (0.05r / s)

Actual distance = communication distance value * resolution (0.25mm)

Actual angle = Communication angle value * resolution (0.01 °)

1. Measure data frame:

Any 01 01 61 AD 00 00 00 00 00 00 46 21 54

00 00 00 00 00 00 00 91 33 60 82 32 F7 93 32 EB 6D 32 E0 51 21 88 00 00

00 5D 21 88 66 21 8D 68 21 BF 41 32 D4 86 33 02 4D 32 E0 89 51 48 8E

51 48 92 51 48 48 € 50 5 48 48% 64 64 64 Cut 51 48

90 51 64 89 51 48 93 51 64 4B 53 2D 57 59 BA 43 2F 78 41 2E E4 00 00

00 54 2E DE 6B 2E E4 6B 2F 50 58 2E E4 7E 2F 64 5D 2F 78 3F 5a 0b 5a

5B FD 57 5B D3 5B 5C 28 59 5C 28 59 5B FD 5E 5E 32 35 BC

AA: Frame

00 9A: Frame length is 0x009A (Note: Just the frame length of the instance frame, not the actual length of the radar)

01: Protocol version

61: Frame type

AD: command word

00 92: Effective Data Length 0x0047

82: Radar speed 130 * 0.05r / s (resolution) = 6.50r / s

00 87: zero point offset

69 78: Start angle 27000 * 0.01 ° (resolution) = 270 °

00: Signal letter 1

00 00: Distance value 1 is 0 * 0.25mm (resolution) = 0mm

46: Signal value 2

21 3A: Distance value 2 is 8506 * 0.25mm (resolution) = 2126mm

.

5E: Signal value 47

5E 32: Distance value 47 is 24114 * 0.25mm (resolution) = 6028mm

35 bc: check code 0x35bc = (AA + 00 + 9A + ... + FD + 5E + 5E + 32)

2. Radar speed failure frame:

The 00 0900 61 A 00 01 69 02 2

AA: Frame header.

00 09: The frame length is 0x0009 (ie 9) bytes (not including the CRC code)

00: Protocol version

61: Frame type

AE: Command word

00 01: Effective Data Length 0x0001

C9: Radar speed 0xc9, 201 * 0.05r / s (resolution) = 10.05r / s

02 2C: Check code 0x022c