



YDLIDAR
TX20
Development

WORKING MECHANISM

When TX20 is powered on, the system automatically starts ranging. The following is the workflow of the TX20 system.

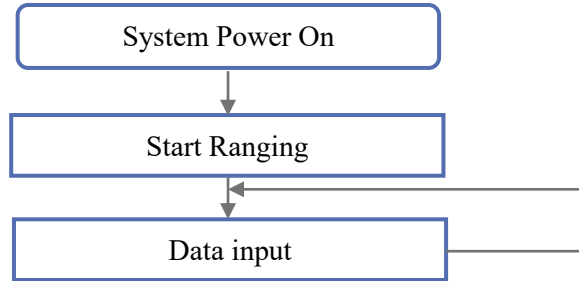


FIG 1 YDLIDAR TX20 SYSTEM WORKFLOW

Sampling Ranging

After power-on, TX20 starts working. At the same time, it will output the start-up message data to the serial port: A55A 05 00 00 40 81. The specific meaning of the message is as follows:

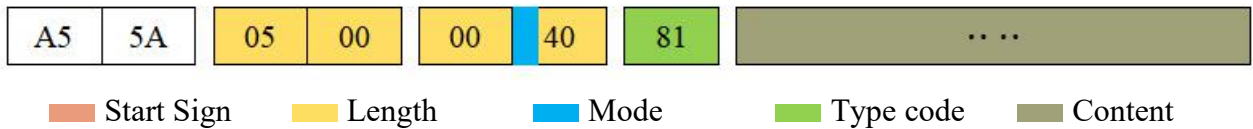


FIG2 YDLIDAR TX20 SYSTEM MESSAGE DATA PROTOCOL

- **Start sign:** The TX20 packet is unified as 0xA55A;
- **Response length:** The response length indicates the length of the response content. However, when the response mode is continuous, the length is infinite, so the value is invalid.;
- **Response mode:** This bit is only 2 bits, indicating that this message is a single response or continuous response. Its value and corresponding mode are as follows:

CHART 1 YDLIDAR TX20 RESPONSE MODE VALUE AND CORRESPONDING MODE

| Response mode | 0x0 | 0x1 | 0x2 | 0x3 |
|---------------|-----------------|---------------------|-----------|-----|
| Mode | Single response | Continuous response | Undefined | |

- **Type code:** The start scan message type code is 0x81.
- **Content:** Scan data, detailed please check Data Protocol.

DATA PROTOCOL

The response content is the point cloud data scanned by the system. According to the following data structure, the data is sent to the external device in hexadecimal to the serial port.

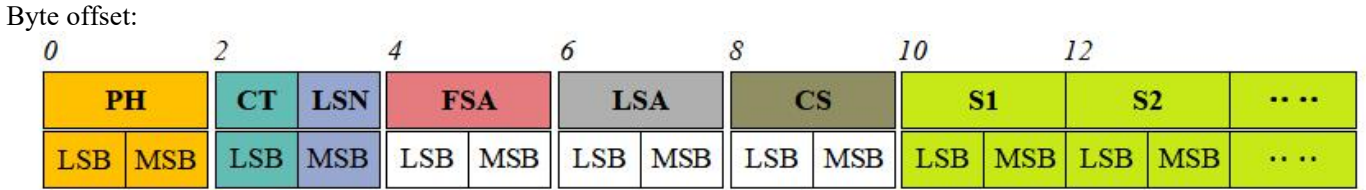


FIG 3 SCAN COMMAND RESPONSE CONTENT DATA STRUCTURE DIAGRAM

CHART 2 SCAN COMMAND RESPONSE CONTENT DATA STRUCTURE DESCRIPTION

| Content | Name | Description |
|---------|-----------------|---|
| PH(2B) | Packet header | The length is 2B, fixed at 0x55AA, low in front, high in back. |
| CT(1B) | Package type | Indicates the current packet type. 0x00: Point cloud packet 0x01: Zero packet. |
| LSN(1B) | Sample quantity | Indicates the number of sample points contained in the current packet; there is only one zero point of data in the zero packet. The value is 1. |
| FSA(2B) | Starting angle | The angle data corresponding to the first sample point in the sampled data. |
| LSA(2B) | End angle | The angle data corresponding to the last sample point in the sampled data. |
| CS(2B) | Check code | The check code of the current data packet uses a two-byte exclusive OR to check the current data packet. |
| Si(2B) | Sampling data | The system test sampling data is the distance data of the sampling point. |

➤ **Zero resolution:**

Start data packet: CT=1, LSN=1, Si=1

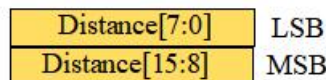
For the analysis of the specific values of distance and angle, see the analysis of distance and angle

➤ **Distance analysis:**

Distance solution formula:

$$\text{Distance}_i = Di[7:0] + Di[15:8] * 256$$

Unit: mm

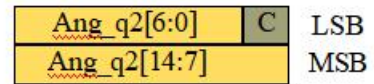


Among them, D_i is the first and second byte data of the sampling data S_i . Suppose Sampling data is E8 03, since the system is in little-endian mode, the sampling point $D = 0x03E8$, and you can get Distance = 1000mm.

➤ **Angle analysis:**

Starting angle solution formula: $Angle_{FSA} = \frac{Rshiftbit(FSA,1)}{64}$

End angle solution formula: $Angle_{LSA} = \frac{Rshiftbit(LSA,1)}{64}$

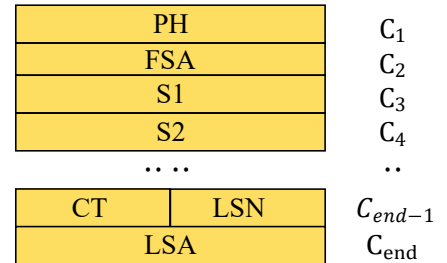


Intermediate angle solution formula: $Angle_i = \frac{diff(Angle)}{LSN-1} * (i - 1) + Angle_{FSA}$ (i = 2,3,...,LSN - 1)

Rshiftbit(data,1) means shifting the data to the right by one bit. diff(Angle) means the clockwise angle difference from the starting angle (uncorrected value) to the ending angle (uncorrected value), and LSN represents the number of packet samples in this frame.

➤ **Check code parsing:**

The check code uses a two-byte exclusive OR to verify the current data packet. The check code itself does not participate in XOR operations, and the XOR order is not strictly in byte order. The XOR sequence is as shown in the figure. Therefore, the check code solution formula is:



$CS = XOR_1^i(C_i) \quad i = 1, 2, \dots, end$

XOR_1^{end} indicates the XOR of the element from subscript 1 to end. However, XOR satisfies the exchange law, and the actual solution may not need to follow the XOR sequence.