YDLIDAR

YDLIDAR TX8 Development Manual

WORKING MECHANISM

When TX8 is powered on, the system automatically starts ranging. The following is the workflow of the TX8 system.
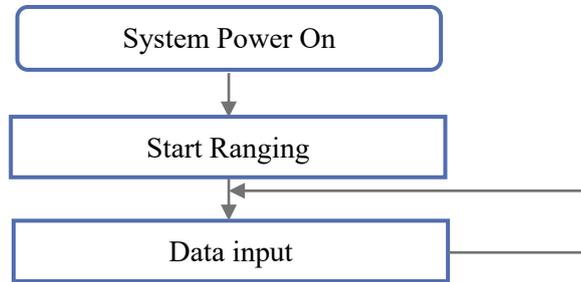


FIG 1 YDLIDAR TX8 SYSTEM WORKFLOW

Sampling Ranging

After power-on, TX8 starts working. At the same time, it will output the start-up message data fto the serial port: A55A 05 00 00 40 81. The specific meaning of the message is as follows:
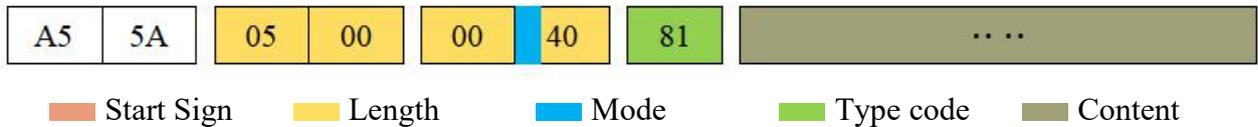
FIG2 YDLIDAR TX8 SYSTEM MESSAGE DATA PROTOCOL

➢ **Start sign**：The TX8 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 TX8 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.

Byte offset:
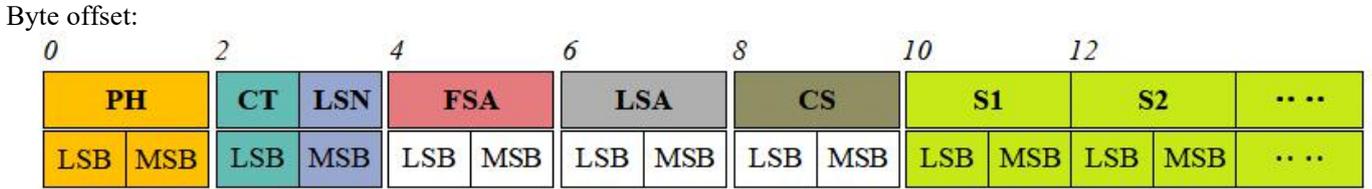
FIG 3 SCAN COMMAND RESPONSE CONTENT DATA STRUCTURE DIAGRAM

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:

$$Distance_i = Di[7{:}0] + Di[15{:}8] * 256$$

Unit: mm

Distance[7:0]	LSB
Distance[15:8]	MSB
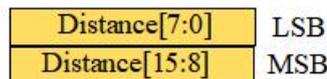
Among them, Di is the first and second byte data of the sampling data Si. Suppose Sampling data is E8 03, since the system is in little-endian mode, the sampling point D = 0x03E8, and you can get Distance = 1000mm.

➢ **Angle analysis:**

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


End angle solution formula：$\text{Angle}_{LSA} = \frac{\text{Rshiftbit(LSA,1)}}{64}$
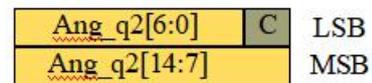
Intermediate angle solution formula：$\text{Angle}_i = \frac{\text{diff(Angle)}}{\text{LSN}-1} * (i-1) + \text{Angle}_{FSA}$ $(i = 2,3,...,\text{LSN}-1)$

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:
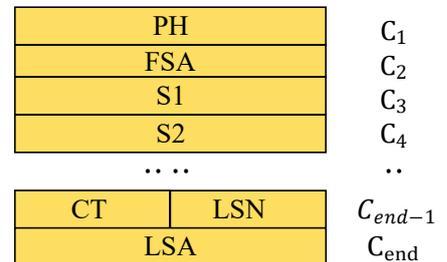
$$CS = \text{XOR}_1^e(C_i) \qquad i = 1,2,...,end$$

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.