镭神智能
LeiShen Intelligent System

Communication Protocol Manual for
N301 LIDAR (Ethernet Interface Version)

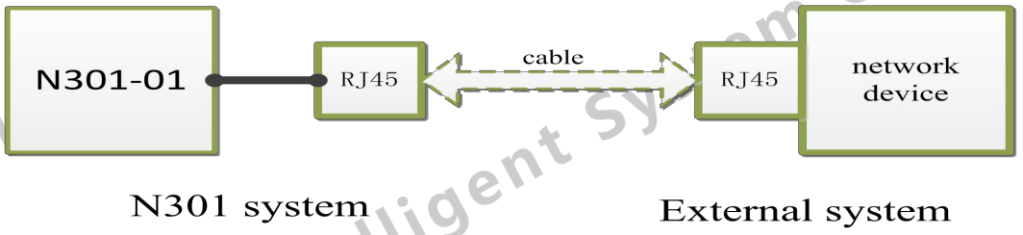
V3.0

1 Statement of Use

This communication protocol manual is one of the manuals prepared by Shenzhen LeiShen Intelligent System Co., Ltd. for the N301 series LIDAR. The Company reserves the right to revise and improve it without notice. For the new manual, please contact the customer service staff or sales staff.

2 Introduction of Communication Interface

The N301 series LIDAR is a 2D scanning measurement radar developed using the principle of TOF (referred to as "N301 series"). N301-01 has a measurement distance of up to 10 meters, and with Ethernet interface as the interface for external communication, it is connected to the external



system through the RJ45 Ethernet interface.

2.1 Basic communication parameters

N301-01 offers high communication rate in order to meet the application requirements. The basic communication parameters are as follows:

Unicast mode:

MAC	60-76-88-00-00-00	Unmodifiable
Local IP	192.168.1.222 (default)	Modifiable
Local port number	2368 (default)	Modifiable
Destination IP	192.168.1.125 (default)	Modifiable
Destination port number	2368 (default)	Modifiable

Broadcast mode:

MAC	60-76-88-00-00-00	Unmodifiable
Local IP	192.168.1.222 (default)	Modifiable

Local port number	2368 (default)	Modifiable
Destination IP	255.255.255.255	Unmodifiable
Destination port number	2368 (default)	Modifiable

Note: UDP broadcast mode and unicast mode can be set in the same way except for the destination IP.

2.2 Communication protocol specification

N301 sends out data with UDP protocol (in broadcast mode by default, which can be set to unicast mode) type for the external system to receive the UDP data. The MAC, local IP, and local port number specified in the basic parameters are network parameters of the N301 system, and the destination IP and destination port number are parameters of the external system. The external system needs to receive the UDP data packet from N301.

3 Basic Communication Protocol

The N301 UDP broadcast mode is LAN communication, and does not support routers and the Internet; unicast mode supports routers and the Internet.

N301 communication uses non-text binary data packets and complies with the standard UDP communication protocol. The Protocol provides the meaning and format of actual data communication, for which the data packets have a unified format.

After powered on, N 301 automatically sends UDP packets to the external system.

Data sent by the N301 to the external system: distance, azimuth, reflectivity, etc. Data sent by the external system to the N301: set speed and other instructions.

3.1 UDP data packet format

Ethernet header	IP header	UDP header	Data
14bytes	20bytes	8bytes	18-1,472bytes

The above request packets data format is HEX, and the overall packet length must be an even number. For the content of the packet header, please refer to the UDP protocol.

3.2 N301 data format

Header	Data (azimuth + distance +ins+GPS	Time	Device
42bytes	12*(2+2+30*(2+1)+3+3)byte	4bytes	2bytes

The above response packets data format is HEX, and the overall packet length must be an even number.

Data header: 42bytes, including 14bytes of Ethernet header, 20bytes of IP header, and 8bytes of UDP header;

Data: 1,200bytes, including azimuth, distance, reflectivity,GPS etc.; Time stamp: 4bytes, used to locate the packet sequence or for GPS;

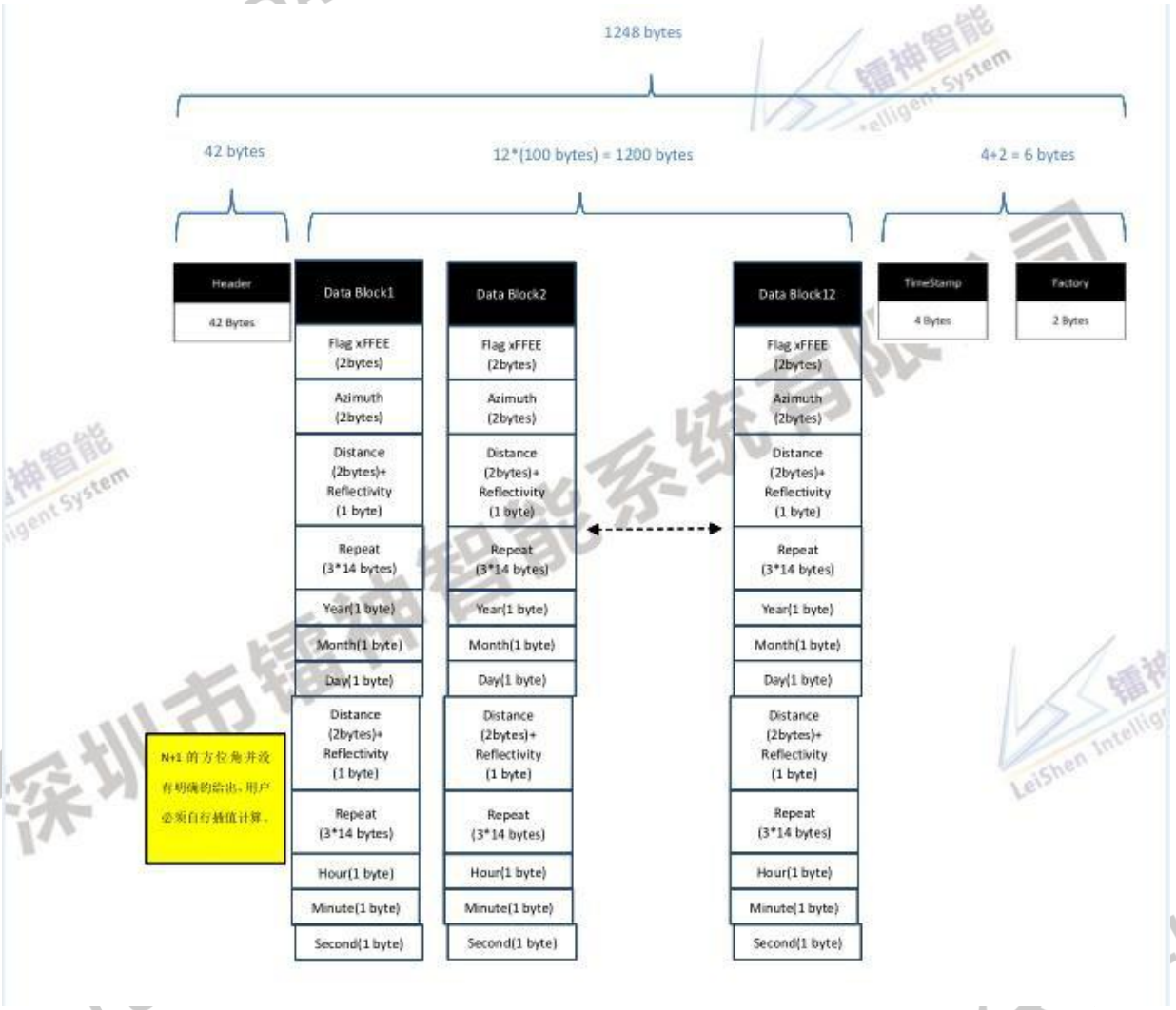
Device marking: 2bytes, which defines the current N301 device type and data type.

3.2.1 Description of data content

The data in the N301 data packets amount to 1,200 bytes, manually divided into 12 data blocks, each transmitting 100 bytes of data. Data Block 1 transmits data with azimuths of N + 0 and N + 29 points, and Data Block 12 transmits data with azimuths of N + 330 and N + 359 points. Therefore, a packet of data transmits 24 points of data.

Flag bit	Azimuth N	Distance + reflectivity	GPS Time	Distance + reflectivity	GPS Time	total
2bytes	2bytes	(2+1)*15bytes	2bytes	(2+1)*15bytes	2bytes	100bytes

The contents of each data block are as follows:



Flag bit:

Each data block has a start flag of 2bytes, like 0xFFEE, which is mainly used to distinguish and identify data blocks. This flag bit is fixed.

Azimuth

Effective data is between 0 - 359.99 °, output 100 times larger, so the actual transmission data is between 0 - 35,999; during transmission, little endian format is used, that is, lower bit precedes upper bit.

Example:

Received azimuth data: 0x96 0x7d

Then the actual azimuth data: 0x7d96

Converted to decimal data: 32150

The actual azimuth is: 321.50

Distance

Each data block contains the distance and reflectivity data of the current azimuth, and the distance and reflectivity of the next azimuth. Distance output range in millimeter (mm). During transmission, little endian format is used, that is, lower bit precedes upper bit.

Example:

Received distance data: 0x89 0x59

Then the actual distance data: 0x5989

Converted to decimal data: 22921

The actual distance: 22,921mm

Notes: The distance value in this protocol is 1/2 of the actual distance value. When the customer analyzes the distance data, it needs to be multiplied.2 can get real distance data.

Reflectivity:

The valid range is between 0 - 255, where 0 - 100 is diffuse reflection, 101 - 254 is specular reflection, and 255 is total reflection.

3.2.2 Description of time stamp

Time stamp: 32-bit unsigned integer in microsecond (us), valid range between 0 -3,600 * 106us. It means the time stamp period is one hour. During transmission, little endian format is used, that is, lower bit precedes upper bit.

Example:

Received time stamp data: 0x61 0x67 0xB9 0x5A

Then the actual time stamp data: 0x5AB96761

Converted to decimal data: 1_522_100_065 us

Converted to seconds: 1522.100065 s divided by 1000_000

If required to convert to minutes: Then divided by 60

3.2.3 Device marking

Device marking contains 2 bytes, with the first byte representing the echo data type, and the second byte indicating the type of the current device in the N301 series, shown as follows:

Byte 1		Byte2	
Val	Mean	Val	Mean
0x37	Single echo	0x20	N301-01
0x38	Reten	0x21	Reten
0x39	Reten	0x22	Reten

Byte 1 represents the echo type, which is currently single echo, reserving data interfaces for multiple echoes.

Byte 2 represents the device type, which is currently N301-01, reserving interfaces for other devices.

3.3 Other format of protocol

For other format of protocol, please wait...