



Rhoeby Dynamics - R2D LiDAR -Protocol Description

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Protocol Description (version 1.0)

Overview

The R2D LiDAR supports bi-directional communications for the purposes of data acquisition, command and control, and status updates. The message format uses a combination of sync bytes, message type, message length, payload data, and a checksum to send and receive information.

The structure of a command/data message is as follows:

- <byte 1> - value: 0xFF, description: Sync byte
- <byte 2> - value: 0xFF, description: Sync byte
- <byte 3> - value: 0x00 - 0x08, description: Message Type (see below)
- <byte 4> - value: 0x00 - 0xFF, description: Payload Length (MSB)
- <byte 5> - value: 0x00 - 0xFF, description: Payload Length (LSB)

- <byte n> - value: 0x00 - 0xFF, description: Payload Data

- <byte n+1> - value: 0x00 - 0xFF, description: Checksum

The checksum is calculated by summing all bytes (including the header), and taking the bitwise-inverse of the sum.

Command Message Types

Command messages are messages sent from the host to the LiDAR device.

The following commands are supported:

- Message Type '0' – SCANNER2D_CMD_START: start scanning
- Message Type '1' – SCANNER2D_CMD_STOP: stop scanning
- Message Type '2' – SCANNER2D_CMD_SET_SCAN_PERIOD: set scan period (in msec)
- Message Type '3' – SCANNER2D_CMD_RESET: reset the scanner
- Message Type '4' – SCANNER2D_CMD_CLEAR_RESET: clear the reset flag (in status message)
- Message Type '5' – SCANNER2D_CMD_SET_SAMPLES_PER_SCAN: set the number of samples per scan
- Message Type '6' – SCANNER2D_CMD_SET_SAMPLE_REJECTION: set sample rejection ('1': enable, '0': disable)
- Message Type '7' – SCANNER2D_CMD_SET_PARK_TRIM: adjust z-axis trim
- Message Type '8' – SCANNER2D_CMD_SET_MIN_MAX_ANGLE: set active area of scan

For more information regarding the command message payload formats, refer to the ROS driver source-code (see <https://github.com/Rhoeby/scanner2d>).

Data Message Types

Data messages are messages sent from the LiDAR device to the host.

The following messages are defined:

- Message Type '0' – Scan Data: payload contains 16-bit range samples
- Message Type '1' - Status Message: payload contains status data about the scanner
- Message Type '2' - Reserved
- Message Type '3' – Reserved
- Message Type 'n' – Not used

Message Type '0' – Scan Data

A scanner producing 500 samples per scan will output a Message Type '0' at the end of each scan, containing 500 x 16-bit samples. Each sample is a consecutive range reading taken from the scan starting with the oldest sample first (at 0-degrees, pointing backwards). The scanner sweeps anti-clockwise and populates the scan data until a full 360-degrees rotation is completed. Upon completion of the scan, the scan message is sent.

Message Type '1' - Status

The scanner outputs a status message at a rate of 1 Hz. The status message is comprised a minimum of five bytes of payload, as follows:

- <payload byte 1> - samples per scan (LSB)
- <payload byte 2> - samples per scan (MSB)
- <payload byte 3> - scan period (LSB)
- <payload byte 4> - scan period (MSB)
- <payload byte 5> - status flags

Future extensions to the protocol shall be performed in a manner to preserve backwards-compatibility.

