

# LD2450

---

## LD2450 Serial Communication Protocol

Rev 1.1

2026/9/23

---

Table of contents

|                                                |    |
|------------------------------------------------|----|
| I Communication Interface Overview.....        | 3  |
| 1.1 Pin Definition.....                        | 3  |
| 1.2 Use and Configuration.....                 | 3  |
| 1.2.1 Typical Application Circuit.....         | 3  |
| II Communication Protocol.....                 | 5  |
| 2.1 Protocol Format.....                       | 5  |
| 2.1.1 Data Format.....                         | 5  |
| 2.1.2 Command Frame Format.....                | 5  |
| 2.2 Command Sending and ACK.....               | 5  |
| 2.2.1 Enable Configuration.....                | 5  |
| 2.2.2 End Configuration.....                   | 6  |
| 2.2.3 Single-Target Tracking.....              | 6  |
| 2.2.4 Multi-Target Tracking.....               | 6  |
| 2.2.5 Query Tracking Mode.....                 | 6  |
| 2.2.6 Read Firmware Version.....               | 7  |
| 2.2.7 Set Serial Baud Rate.....                | 7  |
| 2.2.8 Restore Factory Settings.....            | 8  |
| 2.2.9 Restart Module.....                      | 8  |
| 2.2.10 Bluetooth Settings.....                 | 9  |
| 2.2.11 Get MAC Address.....                    | 9  |
| 2.2.12 Query Area Filtering Configuration..... | 9  |
| 2.2.13 Set Area Filtering Configuration.....   | 10 |
| 2.3 Radar Data Output Protocol.....            | 10 |
| 2.4 Radar Command Configuration Procedure..... | 11 |
| III Revision History.....                      | 11 |

## I Communication Interface Overview



### 1.1 Pin Definition

| Pin Name | Function               |
|----------|------------------------|
| 5V       | 5 V power supply input |
| GND      | Power ground           |
| TX       | Serial TX pin          |
| RX       | Serial RX pin          |

Table 1 Pin Definition Table

### 1.2 Use and Configuration

#### 1.2.1 Typical Application Circuit

The LD2450 module outputs target detection results directly through the serial port according to the specified protocol. The serial output contains the position and speed information of up to three targets, which can be used flexibly according to the application scenario.

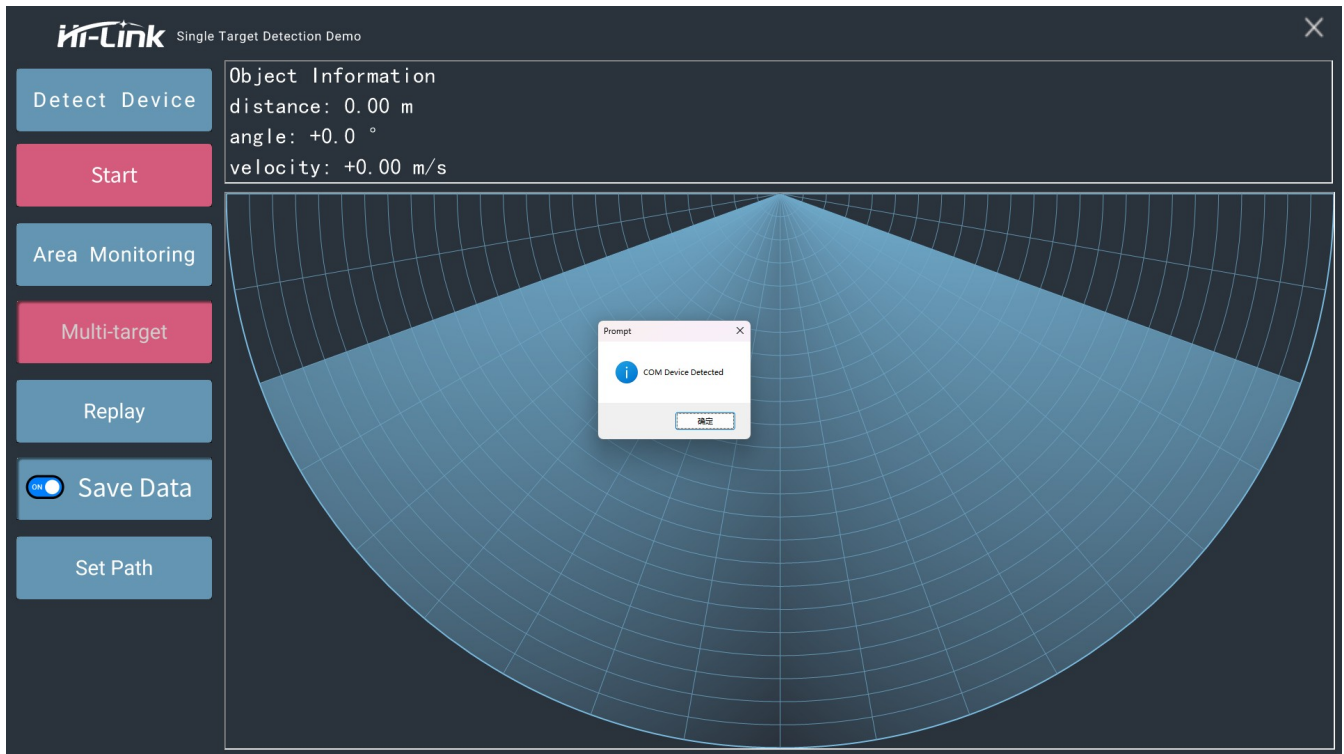
The module supply voltage is 5 V, and the input power supply capability must be greater than 200 mA. The module I/O output level is 3.3 V. The default serial port settings are 256000 baud, 1 stop bit, and no parity.

#### 1.2.2 Visual PC Tool

provides a visual PC demonstration tool for the LD2450, allowing users to intuitively experience the radar module's target positioning and tracking capabilities.

#### PC tool procedure:

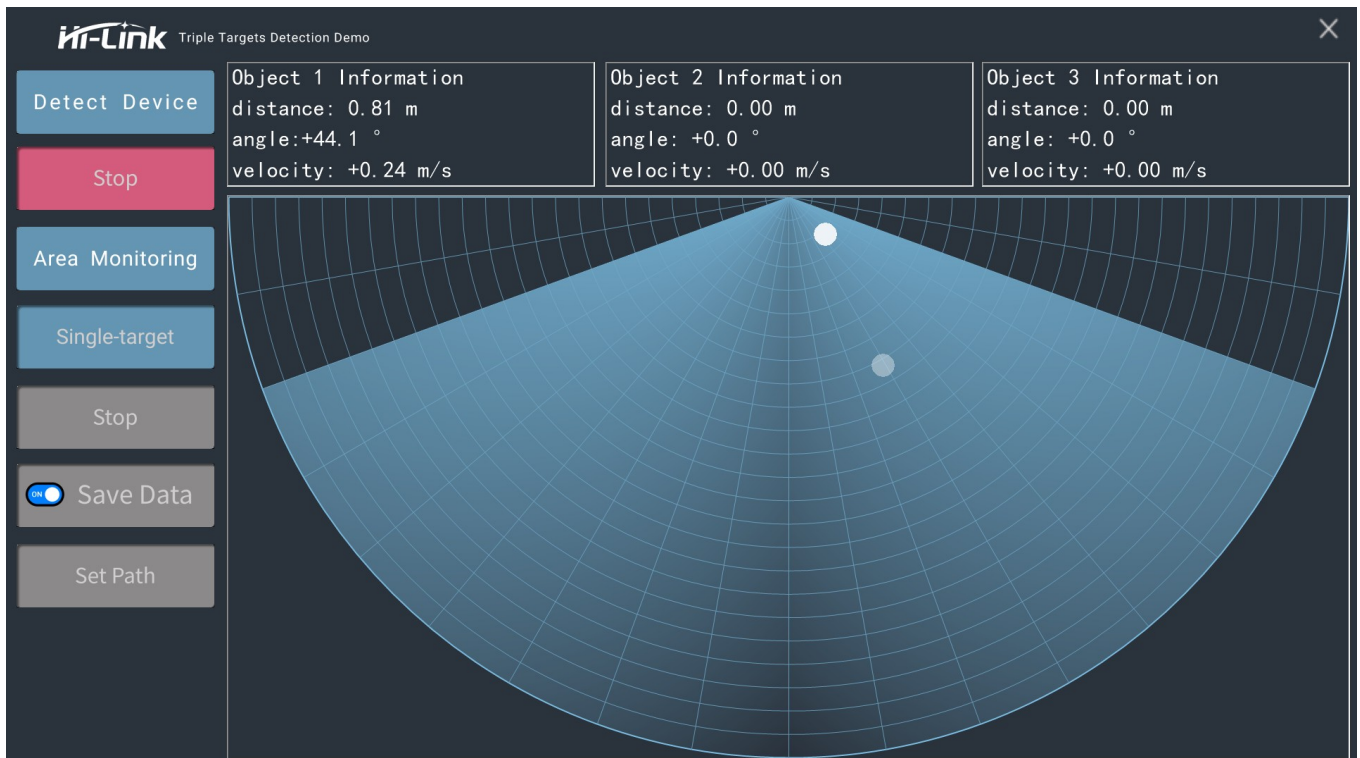
1. Connect the module serial port correctly using a USB-to-serial adapter. Refer to Table 1 for the module pin definition.
2. Open the ICLM\_MTT.exe PC tool. Click "Detect Device"; the PC tool automatically searches for the LD2450 through the serial port.



3. After the module is detected, the PC tool displays a detection prompt.

4. Click “Start”. The PC tool receives the detection data reported by the LD2450 and displays it in real time.

The display includes the real-time positions of up to three targets on the sector plot, together with each target’s distance, angle, and speed information.



## II Communication Protocol

This communication protocol is primarily intended for users who need to perform secondary development without the visual PC tool. The LD2450 communicates externally through a TTL-level serial port. Radar data output and parameter configuration commands are defined by this protocol.

The default serial port settings are 256000 baud, 1 stop bit, and no parity.

### 2.1 Protocol Format

#### 2.1.1 Data Format

LD2450 serial data communication uses little-endian format. All values in the tables in this document are hexadecimal.

#### 2.1.2 Command Frame Format

The radar configuration command and ACK command formats are shown below.

| Frame Header | Data Length | Frame Data  | Frame Tail  |
|--------------|-------------|-------------|-------------|
| FD FC FB FA  | 2 bytes     | See Table 3 | 04 03 02 01 |

Table 2 Transmit Command Frame Format

| Command Word (2 bytes) | Command Value (N bytes) |
|------------------------|-------------------------|
| Command word           | Command value           |

Table 3 Transmit Frame Data Format

| Frame Header | Data Length | Frame Data  | Frame Tail  |
|--------------|-------------|-------------|-------------|
| FD FC FB FA  | 2 bytes     | See Table 5 | 04 03 02 01 |

Table 4 ACK Command Frame Format

| Transmit Command Word | Return Value |
|-----------------------|--------------|
| 0x0100 (2 bytes)      | N bytes      |

Table 5 ACK Frame Data Format

### 2.2 Command Sending and ACK

#### 2.2.1 Enable Configuration

Any other command sent to the radar is valid only after this command is sent.

Command Word: 0x00FF

Command Value: 0x0001

Return Value: 2-byte ACK status (0 = success, 1 = failure) + 2-byte protocol version (0x0001) + 2-byte buffer size (0x0040)

#### Transmit Data:

|             |       |       |       |             |
|-------------|-------|-------|-------|-------------|
| FD FC FB FA | 04 00 | FF 00 | 01 00 | 04 03 02 01 |
|-------------|-------|-------|-------|-------------|

#### Radar ACK (Success):

|             |       |       |       |       |       |             |
|-------------|-------|-------|-------|-------|-------|-------------|
| FD FC FB FA | 08 00 | FF 01 | 00 00 | 01 00 | 40 00 | 04 03 02 01 |
|-------------|-------|-------|-------|-------|-------|-------------|

### 2.2.2 End Configuration

After execution, the radar returns to normal working mode. Enable configuration again before sending another command.

Command Word: 0x00FE

Command Value: None

Return Value: 2-byte ACK status (0 = success, 1 = failure)

#### Transmit Data:

|             |       |       |             |
|-------------|-------|-------|-------------|
| FD FC FB FA | 02 00 | FE 00 | 04 03 02 01 |
|-------------|-------|-------|-------------|

#### Radar ACK (Success):

|             |       |       |       |             |
|-------------|-------|-------|-------|-------------|
| FD FC FB FA | 04 00 | FE 01 | 00 00 | 04 03 02 01 |
|-------------|-------|-------|-------|-------------|

### 2.2.3 Single-Target Tracking

Sets the module to single-target tracking.

Command Word: 0x0080

Command Value: None

Return Value: 2-byte ACK status (0 = success, 1 = failure)

#### Transmit Data:

|             |       |       |             |
|-------------|-------|-------|-------------|
| FD FC FB FA | 02 00 | 80 00 | 04 03 02 01 |
|-------------|-------|-------|-------------|

#### Radar ACK (Success):

|             |       |       |       |             |
|-------------|-------|-------|-------|-------------|
| FD FC FB FA | 04 00 | 80 01 | 00 00 | 04 03 02 01 |
|-------------|-------|-------|-------|-------------|

### 2.2.4 Multi-Target Tracking

Sets the module to multi-target tracking.

Command Word: 0x0090

Command Value: None

Return Value: 2-byte ACK status (0 = success, 1 = failure)

#### Transmit Data:

|             |       |       |             |
|-------------|-------|-------|-------------|
| FD FC FB FA | 02 00 | 90 00 | 04 03 02 01 |
|-------------|-------|-------|-------------|

#### Radar ACK (Success):

|             |       |       |       |             |
|-------------|-------|-------|-------|-------------|
| FD FC FB FA | 04 00 | 90 01 | 00 00 | 04 03 02 01 |
|-------------|-------|-------|-------|-------------|

### 2.2.5 Query Tracking Mode

Queries the current target tracking mode. The default value is multi-target tracking.

Command Word: 0x0091

Command Value: None

Return Value: 2-byte ACK status (0 = success, 1 = failure) + 2-byte tracking mode value (0x0001 = single-target tracking, 0x0002 = multi-target tracking)

#### Transmit Data:

|             |       |       |             |
|-------------|-------|-------|-------------|
| FD FC FB FA | 02 00 | 91 00 | 04 03 02 01 |
|-------------|-------|-------|-------------|

#### Radar ACK (Success):

|             |       |       |       |       |             |
|-------------|-------|-------|-------|-------|-------------|
| FD FC FB FA | 06 00 | 91 01 | 00 00 | 01 00 | 04 03 02 01 |
|-------------|-------|-------|-------|-------|-------------|

Return value 0x0001 indicates single-target tracking mode.

|             |       |       |       |       |             |
|-------------|-------|-------|-------|-------|-------------|
| FD FC FB FA | 06 00 | 91 01 | 00 00 | 02 00 | 04 03 02 01 |
|-------------|-------|-------|-------|-------|-------------|

Return value 0x0002 indicates multi-target tracking mode.

### 2.2.6 Read Firmware Version

This command reads the radar firmware version information.

Command Word: 0x00A0

Command Value: None

Return Value: 2-byte ACK status (0 = success, 1 = failure) + 2-byte firmware type (0x0000) + 2-byte major version + 4-byte minor version

#### Transmit Data:

|             |       |       |             |
|-------------|-------|-------|-------------|
| FD FC FB FA | 02 00 | A0 00 | 04 03 02 01 |
|-------------|-------|-------|-------------|

#### Radar ACK (Success):

|             |       |       |       |       |       |             |             |
|-------------|-------|-------|-------|-------|-------|-------------|-------------|
| FD FC FB FA | 0C 00 | A0 01 | 00 00 | 00 00 | 02 01 | 16 24 06 22 | 04 03 02 01 |
|-------------|-------|-------|-------|-------|-------|-------------|-------------|

Corresponding version: V1.02.22062416

### 2.2.7 Set Serial Baud Rate

This command sets the module serial baud rate. The configured value is retained after power loss and takes effect after the module is restarted.

Command Word: 0x00A1

Command Value: 2-byte baud-rate selection index

Return Value: 2-byte ACK status (0 = success, 1 = failure)

| Selection Index | Baud Rate |
|-----------------|-----------|
| 0x0001          | 9600      |
| 0x0002          | 19200     |
| 0x0003          | 38400     |
| 0x0004          | 57600     |
| 0x0005          | 115200    |
| 0x0006          | 230400    |
| 0x0007          | 256000    |
| 0x0008          | 460800    |

Table 6 Serial Baud Rate Selection

Factory default is 0x0007, corresponding to 256000 baud.

#### transmit data

|             |       |       |       |             |
|-------------|-------|-------|-------|-------------|
| FD FC FB FA | 04 00 | A1 00 | 07 00 | 04 03 02 01 |
|-------------|-------|-------|-------|-------------|

#### Radar ACK (success)

|             |       |       |       |             |
|-------------|-------|-------|-------|-------------|
| FD FC FB FA | 04 00 | A1 01 | 00 00 | 04 03 02 01 |
|-------------|-------|-------|-------|-------------|

### 2.2.8 Restore Factory Settings

This command restores all configuration values to their factory defaults. The values take effect after the module is restarted.

Command Word: 0x00A2

Command Value: None

Return Value: 2-byte ACK status (0 = success, 1 = failure)

#### transmit data

|             |       |       |             |
|-------------|-------|-------|-------------|
| FD FC FB FA | 02 00 | A2 00 | 04 03 02 01 |
|-------------|-------|-------|-------------|

#### Radar ACK (success)

|             |       |       |       |             |
|-------------|-------|-------|-------|-------------|
| FD FC FB FA | 04 00 | A2 01 | 00 00 | 04 03 02 01 |
|-------------|-------|-------|-------|-------------|

#### Factory default settings are as follows:

| Configuration Item | Factory Default       |
|--------------------|-----------------------|
| Serial baud rate   | 256000                |
| Bluetooth switch   | On                    |
| Tracking mode      | Multi-target tracking |
| Area filtering     | Disabled              |

Table 7 Factory Default Configuration Values

### 2.2.9 Restart Module

After receiving this command, the module automatically restarts after completing the ACK response.

Command Word: 0x00A3

Command Value: None

Return Value: 2-byte ACK status (0 = success, 1 = failure)

#### transmit data

|             |       |       |             |
|-------------|-------|-------|-------------|
| FD FC FB FA | 02 00 | A3 00 | 04 03 02 01 |
|-------------|-------|-------|-------------|

#### Radar ACK (success)

|             |       |       |       |             |
|-------------|-------|-------|-------|-------------|
| FD FC FB FA | 04 00 | A3 01 | 00 00 | 04 03 02 01 |
|-------------|-------|-------|-------|-------------|

### 2.2.10 Bluetooth Settings

This command controls whether Bluetooth is enabled. Bluetooth is enabled by default. The configured value is retained after power loss and takes effect after the module is restarted.

Command Word: 0x00A4

Command Value: 0x0100 = enable Bluetooth; 0x0000 = disable Bluetooth

Return Value: 2-byte ACK status (0 = success, 1 = failure)

#### transmit data

|             |       |       |       |             |
|-------------|-------|-------|-------|-------------|
| FD FC FB FA | 04 00 | A4 00 | 01 00 | 04 03 02 01 |
|-------------|-------|-------|-------|-------------|

Indicates Bluetooth ON.

#### Radar ACK (success)

|             |       |       |       |             |
|-------------|-------|-------|-------|-------------|
| FD FC FB FA | 04 00 | A4 01 | 00 00 | 04 03 02 01 |
|-------------|-------|-------|-------|-------------|

### 2.2.11 Get MAC Address

This command queries the MAC address.

Command Word: 0x00A5

Command Value: 0x0001

Return Value: 2-byte ACK status (0 = success, 1 = failure) + 1-byte fixed type (0x00) + 3-byte MAC address (big-endian)

#### transmit data

|             |       |       |       |             |
|-------------|-------|-------|-------|-------------|
| FD FC FB FA | 04 00 | A5 00 | 01 00 | 04 03 02 01 |
|-------------|-------|-------|-------|-------------|

#### Radar ACK (success)

|             |       |       |       |       |       |       |             |
|-------------|-------|-------|-------|-------|-------|-------|-------------|
| FD FC FB FA | 0A 00 | A5 01 | 00 00 | 8F 27 | 2E B8 | 0F 65 | 04 03 02 01 |
|-------------|-------|-------|-------|-------|-------|-------|-------------|

Example MAC address: 8F 27 2E B8 0F 65

### 2.2.12 Query Area Filtering Configuration

This command queries the module's current area filtering configuration.

Command Word: 0x00C1

Command Value: None

Return Value: 2-byte ACK status (0 = success, 1 = failure) + 2-byte area filtering type + 24-byte area coordinate configuration

| Area Filtering Type      | Meaning                                                      |
|--------------------------|--------------------------------------------------------------|
| 0                        | Area filtering disabled                                      |
| 1                        | Detect only targets inside the configured areas              |
| 2                        | Do not detect targets inside the configured areas            |
| Field                    | Description                                                  |
| Area 1 / Area 2 / Area 3 | Coordinates of two diagonal vertices of the rectangular area |
| Coordinate type          | signed int16                                                 |
| Unit                     | mm                                                           |

|             |                             |
|-------------|-----------------------------|
|             |                             |
| Unused area | All coordinate values are 0 |

Table 8 Area Filtering Configuration Value Format

#### transmit data

|             |       |       |             |
|-------------|-------|-------|-------------|
| FD FC FB FA | 02 00 | C1 00 | 04 03 02 01 |
|-------------|-------|-------|-------------|

#### Radar ACK (success)

|             |       |       |       |       |                     |                        |                        |             |
|-------------|-------|-------|-------|-------|---------------------|------------------------|------------------------|-------------|
| FD FC FB FA | 1E 00 | C1 01 | 00 00 | 01 00 | E803 E803 18FC 8813 | 0000 0000<br>0000 0000 | 0000 0000<br>0000 0000 | 04 03 02 01 |
|-------------|-------|-------|-------|-------|---------------------|------------------------|------------------------|-------------|

Example: only targets inside the rectangle defined by diagonal vertices (1000, 1000) and (-1000, 5000) are detected.

### 2.2.13 Set Area Filtering Configuration

This command sets the area filtering configuration. The configuration is retained after power loss and takes effect immediately after setting.

Command Word: 0x00C2

Command Value: 26-byte area filtering configuration; see Table 8.

Return Value: 2-byte ACK status (0 = success, 1 = failure)

#### transmit data

|             |       |       |       |                     |                        |                        |             |
|-------------|-------|-------|-------|---------------------|------------------------|------------------------|-------------|
| FD FC FB FA | 1C 00 | C2 00 | 02 00 | E803 E803 18FC 8813 | 0000 0000<br>0000 0000 | 0000 0000<br>0000 0000 | 04 03 02 01 |
|-------------|-------|-------|-------|---------------------|------------------------|------------------------|-------------|

Example setting: do not detect targets inside the rectangle defined by diagonal vertices (1000, 1000) and (-1000, 5000).

#### Radar ACK (success)

|             |       |       |       |             |
|-------------|-------|-------|-------|-------------|
| FD FC FB FA | 04 00 | C2 01 | 00 00 | 04 03 02 01 |
|-------------|-------|-------|-------|-------------|

## 2.3 Radar Data Output Protocol

The LD2450 communicates with external devices through the serial port and outputs detected target information, including the X coordinate, Y coordinate, and target speed within the detection area.

The default serial port settings are 256000 baud, 1 stop bit, and no parity. The radar reports 10 frames per second.

| Frame Header | Frame Data                                                         | Frame Tail |
|--------------|--------------------------------------------------------------------|------------|
| AA FF 03 00  | Target 1 information + Target 2 information + Target 3 information | 55 CC      |

Table 9 Reported Data Frame Format

| Target X Coordinate                                   | Target Y Coordinate                                   | Target Speed                                                                       | Distance Resolution                        |
|-------------------------------------------------------|-------------------------------------------------------|------------------------------------------------------------------------------------|--------------------------------------------|
| signed int16; MSB 1 = positive, 0 = negative; unit mm | signed int16; MSB 1 = positive, 0 = negative; unit mm | signed int16; MSB 1 = positive, 0 = negative; remaining 15 bits = speed; unit cm/s | uint16; size of one distance gate; unit mm |

Table 10 Frame Data Format

Data example:

```
AA FF 03 00 0E 03 B1 86 10 00 40 01 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 55 CC
```

This data indicates that one target is currently being tracked. Target 2 and Target 3 do not exist, so their corresponding data segments are 0x00.

Target 1 X coordinate:  $0x0E + 0x03 \times 256 = 782$ ;  $0 - 782 = -782$  mm.

Target 1 Y coordinate:  $0xB1 + 0x86 \times 256 = 34481$ ;  $34481 - 2^{15} = 1713$  mm.

Target 1 speed:  $0x10 + 0x00 \times 256 = 16$ ;  $0 - 16 = -16$  cm/s.

Target 1 distance resolution:  $0x40 + 0x01 \times 256 = 320$  mm.

## 2.4 Radar Command Configuration Procedure

Execution of a radar configuration command consists of two stages: the host sends a command and the radar returns an ACK. If the radar does not return an ACK, or returns a failed ACK, the configuration command has failed.

Before sending any other command, the developer must first send the Enable Configuration command and then send the required configuration command within the specified time. After configuration is complete, send the End Configuration command to notify the radar that configuration has finished.

Example: to read a radar configuration parameter, the host first sends the Enable Configuration command. After receiving a successful ACK, it sends the parameter read command. After receiving a successful ACK, it sends the End Configuration command. After the final successful ACK, the complete parameter-read operation is finished.

**Configuration flow:**

| Step | Host / Radar Action                                               |
|------|-------------------------------------------------------------------|
| 1    | Host sends Enable Configuration command                           |
| 2    | Radar returns successful ACK                                      |
| 3    | Host sends required configuration command                         |
| 4    | Radar returns successful ACK                                      |
| 5    | Host sends End Configuration command                              |
| 6    | Radar returns successful ACK; configuration operation is complete |

## III Revision History

| Date       | Version | Modification                                                            |
|------------|---------|-------------------------------------------------------------------------|
| 2023-08-02 | 1.01    | Initial version                                                         |
| 2023-09-07 | 1.02    | Added configuration commands related to area filtering                  |
| 2023-10-17 | 1.03    | Added tracking-mode query command; optimized default-value descriptions |