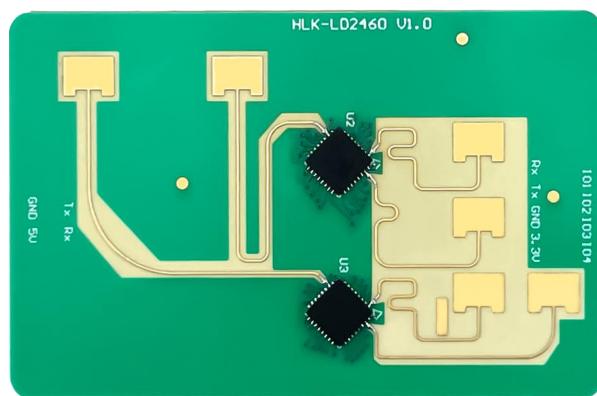




Shenzhen Hi-Link Electronics Co., Ltd.

HLK-LD2460
Moving Target Detection And
Tracking Module Serial Protocol



1. Serial port protocol description

The LD2460 serial port protocol consists of a frame header, function code, data length, data content, and frame tail. The description of each part of the format is shown in Table 1.

Table 1. Description of each part of the serial port protocol

Items	Description
Frame header	Fixed value
Function code	Divided by different functions
Data length	Total number of bytes of frame header + function code + data length + data content + frame tail
Data content	See below
Frame end	Fixed value

2. Radar reporting protocol

After the radar detects a target, it will actively report the target information. The radar reporting protocol is shown in Table 2.

Table 2. Radar target information reporting protocol

Data direction: radar → host computer			
Items	Data length	Value	Description
Frame header	1byte	0xF4	Fixed value
	1byte	0xF3	
	1byte	0xF2	
	1byte	0xF1	
Function code	1byte	0x04	
Data length	2byte	Total length of data packet	Number of targets *4(byte)+11(byte)
Data content	2byte	Target 1-X	X-axis position of target 1 (accuracy 0.1)
	2byte	Target 1-Y	Y-axis position of target 1 (accuracy 0.1)
	...		
	2byte	Target N-X	X-axis position of target N
	2byte	Target N-Y	Y-axis position of target N
Frame end	1byte	0xF8	Fixed value
	1byte	0xF7	
	1byte	0xF6	
	1byte	0xF5	

Data example: There is a target at the coordinates (1.5, 2.3) in the field, and the radar reports

the following: F4 F3 F2 F1 04 0F 00 0F 00 17 00 F8 F7 F6 F5

3. Radar on/off reporting function protocol

The host computer sends an on/off command to the radar to control the radar reporting function. The radar automatically reports by default when it is turned on. After receiving the on/off command, the radar performs the corresponding operation and returns the operation result. The host computer sends the command protocol as shown in Table 3, and the radar receipt protocol is shown in Table 4.

Table 3. Open/Close reporting function command protocol

Data direction: host computer → radar			
Items	Data length	Value	Description
Frame header	1byte	0xFD	Fixed value
	1byte	0xFC	
	1byte	0xFB	
	1byte	0xFA	
Function code	1byte	0x06	
Data length	2byte	Total length of data packet	12
Data content	1byte	0/1	00: Disable radar reporting function 01: Enable radar reporting function
Frame end	1byte	0x04	Fixed value
	1byte	0x03	
	1byte	0x02	
	1byte	0x01	

Data example: The command to turn off the radar reporting function is as follows

FD FC FB FA 06 0C 00 00 04 03 02 01

Table 4. Radar on/off reporting function setting receipt

Data direction: radar → host computer			
Items	Data length	Value	Description
Frame header	1byte	0xFD	Fixed value
	1byte	0xFC	
	1byte	0xFB	
	1byte	0xFA	
Function code	1byte	0x06	
Data length	2byte	Total length of data packet	12

Data content	1byte	High 4 bits: operation result Low 4 bits: operation content	00: Failed to turn off the radar reporting function 10: Successfully turned off the radar reporting function 01: Failed to turn on the radar reporting function 11: Successfully turned on the radar reporting function
Frame end	1byte	0x04	Fixed value
	1byte	0x03	
	1byte	0x02	
	1byte	0x01	

Data example: The receipt for successfully closing the radar reporting function is FD FC FB FA 06 0C 00 10 04 03 02 01

4. Set the installation height & installation angle agreement

The host computer sends a setting command to the radar to set the radar installation height and installation angle parameters. The parameters are still saved after the radar is powered off. After receiving the setting parameters, the radar sets the parameters and returns the setting results after the setting is completed. The protocol for the host computer to send the setting command is shown in Table 5, and the protocol for the radar to receive the receipt is shown in Table 6.

Note: This parameter can only be set when side-mounted.

Table 5. Protocol for setting radar installation parameters

Data direction: host computer → radar			
Items	Data length	Value	Description
Frame header	1byte	0xFD	Fixed value
	1byte	0xFC	
	1byte	0xFB	
	1byte	0xFA	
Function code	1byte	0x07	
Data length	2byte	Total length of data packet	15
Data content	2byte	Installation height	Installation height (m)*100
	2byte	Installation angle	Installation angle (°)*100

Frame end	1byte	0x04	Fixed value
	1byte	0x03	
	1byte	0x02	
	1byte	0x01	

Data example: Set the radar installation height to 2.6 meters and the installation angle to 30 degrees. The host computer sends the following command: FD FC FB FA 07 0F 00 04 01 B8 0B 04 03 02 01

Table 6. Set radar installation parameter receipt

Data direction: radar → host computer			
Items	Data length	Value	Description
Frame header	1byte	0xFD	Fixed value
	1byte	0xFC	
	1byte	0xFB	
	1byte	0xFA	
Function code	1byte	0x07	
Data length	2byte	Total length of data packet	12
Data content	1byte	Setting result	00: Installation parameter setting failed 01: Installation parameter setting successful
Frame end	1byte	0x04	Fixed value
	1byte	0x03	
	1byte	0x02	
	1byte	0x01	

Data example: The instruction for setting radar installation parameters successfully is as follows : FD FC FB FA 07 0C 00 01 04 03 02 01

5. Query installation height and installation angle agreement

The host computer sends a query command to the radar to query the current installation height and installation angle. The radar receives the query command and returns the current installation parameters. The installation parameter query command protocol is shown in Table 7, and the radar returns the installation parameter protocol as shown in Table 8.

Note: This parameter is only queried when side-mounted.

Table 7. Protocol for querying installation parameters

Data direction: host computer → radar			
Items	Data length	Value	Description
Frame header	1byte	0xFD	Fixed value
	1byte	0xFC	
	1byte	0xFB	
	1byte	0xFA	
Function code	1byte	0x08	
Data length	2byte	Total length of data packet	12
Data content	1byte	01	
Frame end	1byte	0x04	Fixed value
	1byte	0x03	
	1byte	0x02	
	1byte	0x01	

Data example: The host computer query installation parameter command is as follows

FD FC FB FA 08 0C 00 01 04 03 02 01

Table 8. Radar installation parameter receipt protocol

Data direction: radar → host computer			
Items	Data length	Value	Description
Frame header	1byte	0xFD	Fixed value
	1byte	0xFC	
	1byte	0xFB	
	1byte	0xFA	
Function code	1byte	0x08	
Data length	2byte	Total length of data packet	15
Data content	2byte	Installation height	Installation height (m)*100
	2byte	Installation angle	Installation angle (°)*100
Frame end	1byte	0x04	Fixed value
	1byte	0x03	
	1byte	0x02	
	1byte	0x01	

Data example: The current installation height is 2.6 meters, the installation angle is 30 degrees, and the radar receipt information is as follows

FD FC FB FA 08 0F 00 04 01 B8 0B 04 03 02 01

6. Setting the installation mode

Send a setting command to the radar to set the radar installation mode (side mount/top mount). After receiving the setting command, the radar performs the operation and returns the operation result. The radar installation mode setting protocol is shown in Table 9, and the radar receipt protocol is shown in Table 10.

Table 9. Protocol for setting radar installation mode

Data direction: host computer → radar			
Items	Data length	Value	Description
Frame header	1byte	0xFD	Fixed value
	1byte	0xFC	
	1byte	0xFB	
	1byte	0xFA	
Function code	1byte	0x09	
Data length	2byte	Total length of data packet	12
Data content	1byte	01/02	01: Side mounting 02: Top mounting
Frame end	1byte	0x04	Fixed value
	1byte	0x03	
	1byte	0x02	
	1byte	0x01	

Data example: The host computer sets the installation mode to side installation command as follows : FD FC FB FA 09 0C 00 01 04 03 02 01

Table 10. Set Installation Mode Radar Receipt Protocol

Data direction: radar → host computer			
Items	Data length	Value	Description
Frame header	1byte	0xFD	Fixed value
	1byte	0xFC	
	1byte	0xFB	
	1byte	0xFA	
Function code	1byte	0x09	
Data length	2byte	Total length of data packet	12

Data content	1byte	High 4 bits: operation result Low 4 bits: setting content	01: Setting side installation failed 11: Setting side installation successful 02: Setting top installation failed 12: Setting top installation successful
Frame end	1byte	0x04	Fixed value
	1byte	0x03	
	1byte	0x02	
	1byte	0x01	

Set the side installation success receipt command as follows: FD FC FB FA 09 0C 00 11 04
03 02 01

7. Query installation mode protocol

The host computer sends a query command to the radar to query the currently set installation mode (side mount/top mount). After receiving the query command, the radar returns the current mode information. The command protocol for querying the radar installation mode is shown in Table 11, and the radar returns the installation mode protocol as shown in Table 12.

Table 11. Protocol for querying radar installation mode

Data direction: host computer → radar			
Items	Data length	Value	Description
Frame header	1byte	0xFD	Fixed value
	1byte	0xFC	
	1byte	0xFB	
	1byte	0xFA	
Function code	1byte	0xA	
Data length	2byte	Total length of data packet	12
Data content	1byte	01	
Frame end	1byte	0x04	Fixed value
	1byte	0x03	
	1byte	0x02	
	1byte	0x01	

Data example: The command to query the radar installation mode is as follows

FD FC FB FA 0A 0C 00 01 04 03 02 01

Table 12. Radar installation mode receipt instructions

Data direction: radar → host computer			
Items	Data length	Value	Description
Frame header	1byte	0xFD	Fixed value
	1byte	0xFC	
	1byte	0xFB	
	1byte	0xFA	
Function code	1byte	0x0A	
Data length	2byte	Total length of data packet	12
Data content	1byte	01/02	01: Side mounting 02: Top mounting
Frame end	1byte	0x04	Fixed value
	1byte	0x03	
	1byte	0x02	
	1byte	0x01	

Data example: The current installation mode is top installation, and the receipt instruction is as follows : FD FC FB FA 0A 0C 00 02 04 03 02 01

8. Firmware version query protocol

The host computer sends a firmware version query command to the radar, and the radar returns the version number of the currently running firmware after receiving the command. The firmware version query protocol is shown in Table 13, and the radar version receipt protocol is shown in Table 14.

Table 13. Protocol for querying firmware version number

Data direction: host computer → radar			
Items	Data length	Value	Description
Frame header	1byte	0xFD	Fixed value
	1byte	0xFC	
	1byte	0xFB	
	1byte	0xFA	
Function code	1byte	0x0B	
Data length	2byte	Total length of data packet	12
Data content	1byte	01	
Frame end	1byte	0x04	Fixed value
	1byte	0x03	
	1byte	0x02	
	1byte	0x01	



The command to query the current firmware version number is: FD FC FB FA 0B 0C 00 01
04 03 02 01

Table 14. Radar version number receipt protocol

Data direction: radar → host computer			
Items	Data length	Value	Description
Frame header	1byte	0xFD	Fixed value
	1byte	0xFC	
	1byte	0xFB	
	1byte	0xFA	
Function code	1byte	0x0B	
Data length	2byte	Total length of data packet	16
Data content	1byte	Installation mode	01: Side mounting 02: Top mounting
	1byte	Year	
	1byte	Month	
	1byte	Major version number	
	1byte	Minor version number	
Frame end	1byte	0x04	Fixed value
	1byte	0x03	
	1byte	0x02	
	1byte	0x01	

Data example: The current firmware version is V1.2, February 25, and the radar returns the following information: FD FC FB FA 0B 10 00 02 19 02 01 02 04 03 02 01

9. Firmware upgrade command protocol

The host computer sends an upgrade command to the radar, and the radar enters the waiting state after receiving the upgrade command. Then the host computer sends the latest firmware to the radar according to the upgrade protocol. If the upgrade fails, it automatically returns to the previous version of the firmware. The firmware upgrade command protocol is shown in Table 15.

Table 15. Radar firmware upgrade command protocol

Data direction: host computer → radar			
Items	Data length	Value	Description
Frame header	1byte	0xFD	Fixed value
	1byte	0xFC	

	1byte	0xFB	
	1byte	0xFA	
Function code	1byte	0x0C	
Data length	2byte	Total length of data packet	12
Data content	1byte	01/02	01: Upgrade side-mounted firmware 02: Upgrade top-mounted firmware
Frame end	1byte	0x04	Fixed value
	1byte	0x03	
	1byte	0x02	
	1byte	0x01	

Data example: To upgrade the side-mounted firmware, send the following command to the radar:
 FD FC FB FA 0C 0C 00 01 04 03 02 01

10. Restart radar command protocol

The host computer sends a restart command to the radar, and the radar restarts after receiving the command. The radar restart command protocol is shown in Table 16.

Table 16. Radar restart protocol

Data direction: host computer → radar			
Items	Data length	Value	Description
Frame header	1byte	0xFD	Fixed value
	1byte	0xFC	
	1byte	0xFB	
	1byte	0xFA	
Function code	1byte	0x0D	
Data length	2byte	Total length of data packet	12
Data content	1byte	01	
Frame end	1byte	0x04	Fixed value
	1byte	0x03	
	1byte	0x02	
	1byte	0x01	

Data example: The radar restart command is as follows

FD FC FB FA 0D 0C 00 01 04 03 02 01

11. Setting the radar baud rate

The host computer sends a baud rate modification command to the radar. After receiving the command, the radar sets the baud rate and returns the setting result. The command sent by the host computer is shown in Table 17, and the radar receipt protocol is shown in Table 18.

Table 17. Radar modify baud rate protocol

Data direction: host computer → radar			
Items	Data length	Value	Description
Frame header	1byte	0xFD	Fixed value
	1byte	0xFC	
	1byte	0xFB	
	1byte	0xFA	
Function code	1byte	0x0E	
Data length	2byte	Total length of data packet	12
Data content	1byte	Baud rate serial number	0: 9600 1: 19200 2: 38400 3: 57600 4: 115200 5: 230400 6: 256000 7: 460800
Frame end	1byte	0x04	Fixed value
	1byte	0x03	
	1byte	0x02	
	1byte	0x01	

Data example: To change the baud rate to 115200, the host computer sends the following command: FD FC FB FA 0E 0C 00 04 04 03 02 01

Table 18. Radar modify baud rate receipt protocol

Data direction: radar → host computer			
Items	Data length	Value	Description
Frame header	1byte	0xFD	Fixed value
	1byte	0xFC	
	1byte	0xFB	
	1byte	0xFA	
Function code	1byte	0x0E	
Data length	2byte	Total length of data packet	12

Data content	1byte	00/01	00: Baud rate setting failed 01: Baud rate setting successful
Frame end	1byte	0x04	Fixed value
	1byte	0x03	
	1byte	0x02	
	1byte	0x01	

The radar replies that the baud rate has been modified successfully: FD FC FB FA 0E 0C 00

01 04 03 02 01

12. Restore factory settings

The host computer sends a factory reset command to the radar. The radar sets the baud rate to the default value: 115200, the installation mode to: side-mounted, the installation height to 2.6 meters, the installation angle to 30°, the side-mounted detection range to 6 meters, ±60°, and the top-mounted detection range to 4 meters 0-360°. After the radar is set, the setting result is returned. The factory reset protocol is shown in Table 19, and the radar factory reset receipt is shown in Table 20.

Table 19 Restore factory settings protocol

Data direction: host computer → radar			
Items	Data length	Value	Description
Frame header	1byte	0xFD	Fixed value
	1byte	0xFC	
	1byte	0xFB	
	1byte	0xFA	
Function code	1byte	0x10	
Data length	2byte	Total length of data packet	12
Data content	1byte	01	
Frame end	1byte	0x04	Fixed value
	1byte	0x03	
	1byte	0x02	
	1byte	0x01	

Data example: The host computer sends the following factory setting command to the radar:

FD FC FB FA 10 0C 00 01 04 03 02 01

Table 20. Radar factory reset receipt

Data direction: radar → host computer			
Items	Data length	Value	Description
Frame header	1byte	0xFD	Fixed value
	1byte	0xFC	
	1byte	0xFB	
	1byte	0xFA	
Function code	1byte	0x10	
Data length	2byte	Total length of data packet	12
Data content	1byte	00/01	00: Factory reset failed 01: Factory reset successful
Frame end	1byte	0x04	Fixed value
	1byte	0x03	
	1byte	0x02	
	1byte	0x01	

Radar factory reset successful receipt: FD FC FB FA 10 0C 00 01 04 03 02 01

13.Detection range setting

The host computer sends a detection range setting command to the radar to set the radar detection distance and detection angle. The maximum detection distance for side-mounted installation is 6 meters, and the angle range is $\pm 60^\circ$; the maximum detection distance for top-mounted installation is 4 meters, and the angle is 0-360°. This setting only sets the detection range in the current installation mode. The radar detection range setting protocol is shown in Table 21, and the radar receipt protocol is shown in Table 22.

Table 21. Radar detection range setting protocol

Data direction: host computer → radar			
Items	Data length	Value	Description
Frame header	1byte	0xFD	Fixed value
	1byte	0xFC	
	1byte	0xFB	
	1byte	0xFA	
Function code	1byte	0x11	
Data length	2byte	Total length of data packet	16
Data content	1byte	Distance	Distance*10 units (meters*10)
	2byte	Starting angle	Angle*10 ($^\circ$ *10)

	2byte	End angle	Angle*10 ($^{\circ} * 10$)
Frame end	1byte	0x04	Fixed value
	1byte	0x03	
	1byte	0x02	
	1byte	0x01	

Data example: The radar is set to detect a distance of 6 meters and a detection angle of $\pm 50^{\circ}$.

The host computer commands are as follows: FD FC FB FA 11 10 00 3C 0C FE F4 01 04 03
02 01

Table 22. Radar setting detection range receipt

Data direction: radar → host computer			
Items	Data length	Value	Description
Frame header	1byte	0xFD	Fixed value
	1byte	0xFC	
	1byte	0xFB	
	1byte	0xFA	
Function code	1byte	0x11	
Data length	2byte	Total length of data packet	12
Data content	1byte	00/01	00: Detection range setting failed 01: Detection range setting successful
Frame end	1byte	0x04	Fixed value
	1byte	0x03	
	1byte	0x02	
	1byte	0x01	

Radar detection range setting success receipt: FD FC FB FA 11 0C 00 01 04 03 02 01

14.Detection range query

The radar sends a detection range query command to the host computer, and the host computer returns information such as detection distance and angle. Only the detection range in the current installation mode is returned. The detection range query command is shown in Table 23, and the radar receipt is shown in Table 24.

Table 23. Query detection range protocol

Data direction: host computer → radar			
Items	Data length	Value	Description
Frame header	1byte	0xFD	Fixed value
	1byte	0xFC	

	1byte	0xFB	
	1byte	0xFA	
Function code	1byte	0x12	
Data length	2byte	Total length of data packet	12
Data content	1byte	01	
Frame end	1byte	0x04	Fixed value
	1byte	0x03	
	1byte	0x02	
	1byte	0x01	

Query detection range command: FD FC FB FA 12 0C 00 01 04 03 02 01

Table 24. Query detection range receipt

Data direction: radar → host computer			
Items	Data length	Value	Description
Frame header	1byte	0xFD	Fixed value
	1byte	0xFC	
	1byte	0xFB	
	1byte	0xFA	
Function code	1byte	0x12	
Data length	2byte	Total length of data packet	16
Data content	1byte	Distance	Distance*10 units (meters*10)
	2byte	Starting angle	Angle*10 ($^{\circ}$ *10)
	2byte	End angle	Angle*10 ($^{\circ}$ *10)
Frame end	1byte	0x04	Fixed value
	1byte	0x03	
	1byte	0x02	
	1byte	0x01	

Data example: If the current installation mode is side-mounted, the radar detection distance is 6 meters, and the detection angle is $\pm 50^{\circ}$, the receipt is as follows

FD FC FB FA 12 10 00 3C 0C FE F4 01 04 03 02 01

15. Radar detection sensitivity setting

The host computer sends a sensitivity setting command to the radar, and the radar sets the sensitivity after receiving the command. Only the sensitivity of the current operation mode is set. The sensitivity setting protocol is shown in Table 25, and the radar receipt is

shown in Table 26.

Note: This protocol is a reserved protocol and specific functions are yet to be added.

Table 25. Radar sensitivity setting protocol

Data direction: host computer → radar			
Items	Data length	Value	Description
Frame header	1byte	0xFD	Fixed value
	1byte	0xFC	
	1byte	0xFB	
	1byte	0xFA	
Function code	1byte	0x13	
Data length	2byte	Total length of data packet	12
Data content	1byte	Sensitivity value	01: High sensitivity 02: Medium sensitivity 03: Low sensitivity
Frame end	1byte	0x04	Fixed value
	1byte	0x03	
	1byte	0x02	
	1byte	0x01	

Set high sensitivity command: FD FC FB FA 13 0C 00 01 04 03 02 01

Table 26. Sensitivity setting receipt

Data direction: radar → host computer			
Items	Data length	Value	Description
Frame header	1byte	0xFD	Fixed value
	1byte	0xFC	
	1byte	0xFB	
	1byte	0xFA	
Function code	1byte	0x13	
Data length	2byte	Total length of data packet	12
Data content	1byte	00/01	00: Sensitivity setting failed 01: Sensitivity setting successful
Frame end	1byte	0x04	Fixed value
	1byte	0x03	
	1byte	0x02	
	1byte	0x01	

Sensitivity setting success receipt: FD FC FB FA 13 0C 00 01 04 03 02 01

16.Sensitivity query

The host computer sends a sensitivity query command to the radar, and the radar returns the current sensitivity value. The sensitivity query protocol is shown in Table 27, and the radar response sensitivity protocol is shown in Table 28.

Table 27. Sensitivity query protocol

Data direction: host computer → radar			
Items	Data length	Value	Description
Frame header	1byte	0xFD	Fixed value
	1byte	0xFC	
	1byte	0xFB	
	1byte	0xFA	
Function code	1byte	0x14	
Data length	2byte	Total length of data packet	12
Data content	1byte	01	
Frame end	1byte	0x04	Fixed value
	1byte	0x03	
	1byte	0x02	
	1byte	0x01	

Data example: The host computer sends the following sensitivity query command to the radar

FD FC FB FA 14 0C 00 01 04 03 02 01

Table 28. Sensitivity query receipt protocol

Data direction: radar → host computer			
Items	Data length	Value	Description
Frame header	1byte	0xFD	Fixed value
	1byte	0xFC	
	1byte	0xFB	
	1byte	0xFA	
Function code	1byte	0x14	
Data length	2byte	Total length of data packet	12
Data content	1byte	Sensitivity value	01: High sensitivity 02: Medium sensitivity 03: Low sensitivity
Frame end	1byte	0x04	Fixed value
	1byte	0x03	
	1byte	0x02	
	1byte	0x01	



Data example: The radar returns that the current sensitivity is medium, and the reply instruction is as follows: FD FC FB FA 14 0C 00 02 04 03 02 01



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