

KLM800 Radar Level Sensor Module Manual

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1.Introduction

Millimeter wave radar component is mainly composed of radio frequency unit, processing unit and printed board antenna. Millimeter wave radar can penetrate light, rain, dust, fog or frost and other obstacles to detect targets. It is a small sensor that works all day long and has the advantages of high integration, small size and flexible interface.

This product level meter radar is developed based on millimeter wave radar, measuring the height of radar antenna from the liquid level, widely used in: river, reservoir and other water resources measurement, tank level and water level measurement.

The modules can be derived from the following devices:

The radar ranging module adopts 80G high-frequency chip to support ranging in different working conditions such as solid state and liquid.

Select configuration lens antenna, can adapt to different environments.

Used in water conservancy engineering, sewage treatment plant, petroleum chemical plant.



Integrated radar level gauge



Split radar level gauge

2.Feature

- High integration
- Small volume
- Flexible interface
- It can detect targets through obstacles such as light, rain, dust, fog or frost
- Small sensors that work all day long

3.Technical Specifications

(1) The main technical indicators of TTL version of radar module are shown in the following table:

Model number	KLM800_TTL
Measure the frequency	80GHz
Means of communication	Serial port TTL
Sampling frequency	160 ms/configurable
Standby current	1.5 MA
Distance measurement accuracy	±2mm
Communication protocol	modbus
Antenna beam width	±3°
Supply voltage	3.3 V
Range of measurement	0.4~40 m 0.15~20m 0.06~3m
Dimensions of modules	47 mm diameter 64 mm diameter
Working humidity	0~95%
Operating temperature	-20~70℃
Operating instantaneous current	500MA

(2) The main technical indicators of radar module RS_485 version are shown in the following table:

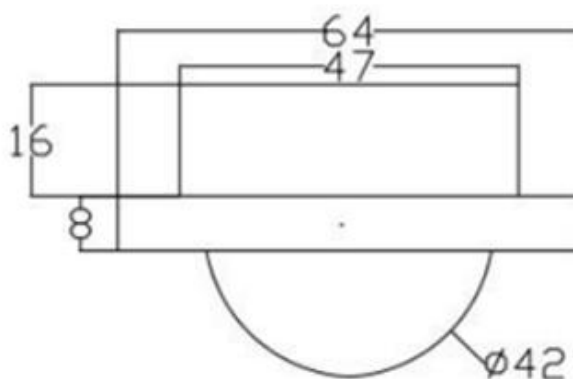
Model number	KLM800_485
Frequency of measurement	80GHz
Means of communication	RS_485
Frequency of acquisition	160 ms/configurable
Current of operation	12V 30MA
Distance measurement accuracy	±2mm
Communication protocol	modbus
Antenna beam width	±2.75°
Supply voltage	9-24V
Range of measurement	3m;10m;20m;40m
Dimensions of modules	47 mm diameter 64 mm diameter
Working humidity	0~95%
Operating temperature	-20~70℃

4.Dimensions

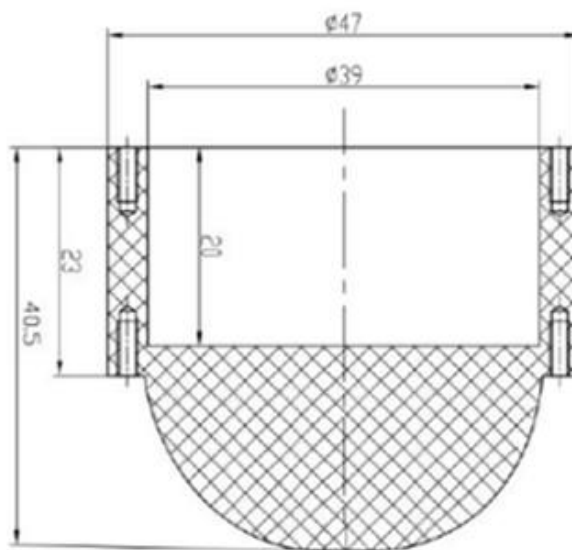
4.1 LeiDaMo group



4.2 Large diameter antenna (64mm)



4.3 Small aperture antenna (47mm)



5.Power supply and communication

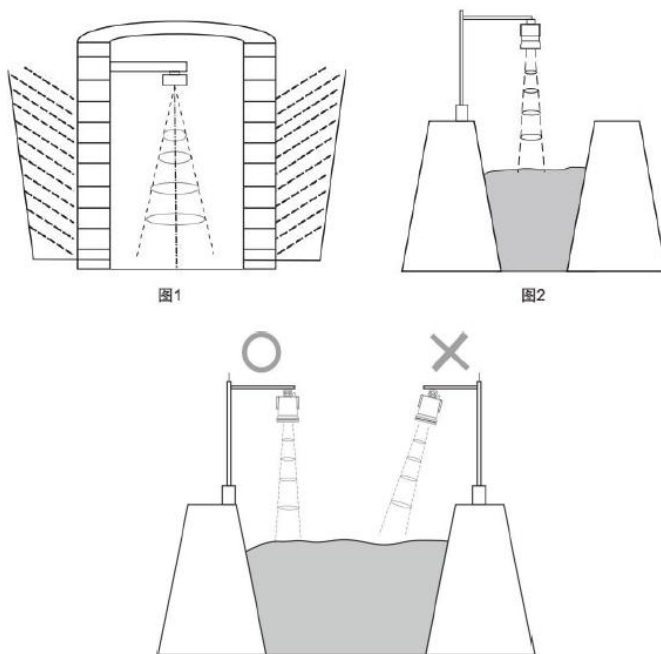
The module interface is shown in the following figure:

Interface	Name	Function
1	Download the mouth	For STLINK firmware upgrade and simulation debugging
2	Power supply port	3.3 V power supply, GND
3	Serial port	Used for timing command issuance

6.Equipment installation instructions

When installing the module, try to keep it fixed to avoid module jitter and keep the surrounding environment as open as possible.

1. The distance between the module and the water surface is higher than 30cm to ensure that the front face of the module (antenna surface) is parallel to the measuring liquid level;
2. The distance between the module and the edge of the tank, the edge of the pool, the edge of the river dam and the edge of the pool is greater than 1 meter;
3. choose the less volatile the location of the installation module (try not to install in the injection port and outlet undulation is big, the undulation, the greater the measurement precision, the worse).
4. Installation diagram



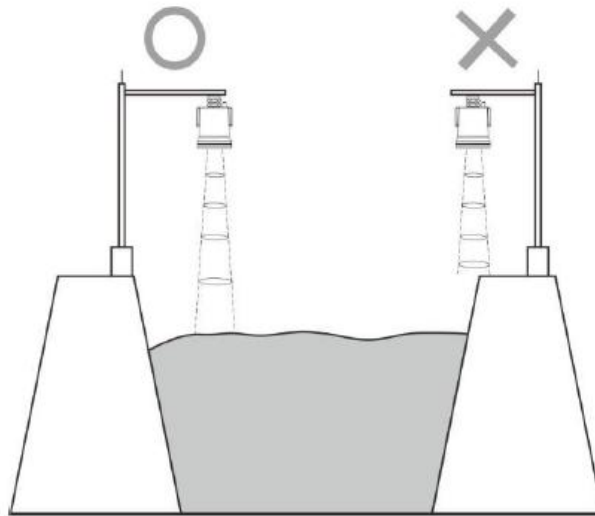
Guarantee within the scope of the beam without distractions, such as Banks of the river bank.

Points to note

Module installation to maintain constant as far as possible, avoid module jitter, surrounding environment to open as much as possible.

1. The distance between the module and the water surface is higher than 30cm to ensure that the front face of the module (antenna surface) is parallel to the measuring liquid level
2. The distance between the module and the edge of the tank, the edge of the pool, the edge of the river dam and the edge of the pool is greater than 0.5 meters;
3. choose the less volatile the location of the installation module (try not to install in the injection port and

outlet undulation is big, the undulation, the greater the accuracy of measurement, the worse))



7.A serial port communication protocol

Frame head (1B)	0XFF
Measuring dismissal (4B)	Height measurement (floating-point type, in centimeters)
Check and (1 b)	The measurement result is rounded, and the high byte and low byte are summed and the low byte is taken as the checksum

For example, the sent data is FF 2A 4B 90 42 47, where FF is the frame header, the middle 4 bytes "2A 4B 90 42" is the distance information, and the size end sets its true information to 42 90 4B 2A (hexadimal floating point type), which is converted to decimal 72.1468 cm.

47 is a checksum, its calculation is as follows:

First to convert floating point distance 72.1468 uint32_t integer (4 bytes) to 72, in low level in two bytes 0 (HEX 0), low of 72 (HEX 48) as the checksum as frame head low, high + + integer integer to take low 8 bits, $(FF + 0x00 + 0x48) \& 0x47x00ff = 0$.

Add: SScom test mode

Can be tested using a serial port to help (hand SScom) :

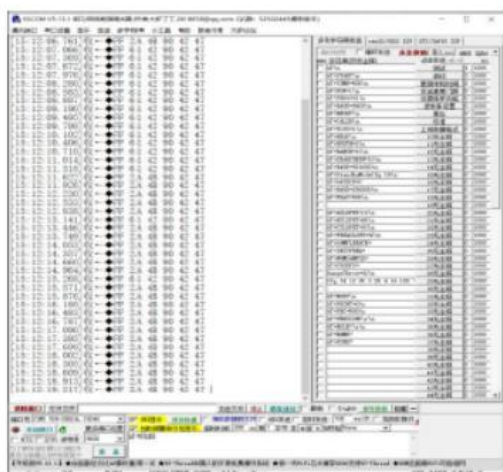
1. Use the USB serial port module connected to the computer USB interface, open SSCOM serial debugging software, choice

The correct port;

2.Send the AT + TLVS = 1 \ n, to convert the output string, according to send the command

"AT + START \ n";

3.The output string



Hexadecimal output



String output result

Note: the default baud rate to 9600. If you open a string with no right side of SSCOM, click the extension to the right of "Save Parameters" to display it.

Common instruction specification	
AT+START\n	Start the command
AT+RESET\n	Reset command
AT+BAUD=9600\n	Baud rate command
AT+TIME =160\n	Frame cycle (that is, change the output interval)
AT+READ\n	Check that the common configuration is correct
AT+TLVS=1\n	Change the output (default is 0 in hexadecimal)

Notes:

In the working state of the MCU, to configure, first send the reset command (interrupt the work), customize the input command, then send the reset command (make the configuration effective), and send the start command.

8. The MODBUS RTU communication protocol

8.1 Setup instructions: function code 0 x10

8.1.1 Restore factory Settings

Request command:

Device address	Function code	Starting address	Register count	Data length	Data	CRC
0x7F	0x10	0x10 00	0x00 01	0x02	0x00 00	0x9E 33

Data definition: 0 to restore the factory Settings, 1 to restart the program.

Reply data:

Device address	Function code	Starting address	Register count	CRC
0x7F	0x10	0x10 00	0x00 01	0x0F 17

Examples:

Request: 7 f 10 10 00 00 02 00 00 9 e 33 01

Reply: 7 f 10 10 00 00 0 f 17 01

Where the data part 00 00 means to restore the factory Settings.

8.1.2 From the machine address

Request command:

Device address	Function code	Starting address	Register count	Data length	Data	CRC
0x7F	0x10	0x20 01	0x00 01	0x02	0x00 01	0x6E 21

Data definition: value range 1--247.

Reply data:

Device address	Function code	Starting address	Register count	CRC
0x7F	0x10	0x20 01	0x00 01	0x51 D7

Examples:

Request: 7F 10 20 01 00 01 02 00 01 6E 21

Reply: 7 f 10 20 01 00 01 51 D7

The data part 00 01 indicates that the slave address is set to 1.

8.1.3 Range of measurement

Request command:

Device address	Function code	Starting address	Register count	Data length	Data	CRC
0x7F	0x10	0x20 46	0x00 02	0x04	0x00 00 41 30	0x40 19

Data definition: The data value is Float data, the unit is meters, the data length value is 4 bytes, the data format is low 16 bits of data in the front, high 16 bits of data in the back.

Reply data:

Device address	Function code	Starting address	Register count	CRC
0x7F	0x10	0x20 46	0x00 02	0xA1 C3

Examples:

Request: 7 46 00 02 04 f 10 20 00 00 41 30 to 40 19

Re: 7F 10 20 46 00 02 A1 C3

00 00 41 30 into which the data portion of the floating-point data that is 11 meters.

8.1.4 Measure the time interval

Request command:

Device address	Function code	Starting address	Register count	Data length	Data	CRC
0x7F	0x10	0x20 2E	0x00 01	0x02	0x03 E8	0xA8 C0

Data definition: Set the time interval of water level meter data collection, unit ms, and the minimum value is 100ms.

Reply data:

Device address	Function code	Starting address	Register count	CRC
0x7F	0x10	0x20 2E	0x00 01	0x60 1E

Examples:

Request: 7 2 e f 10 20 00 02 03 01 E8 A8 C0

Reply: 7F 10 20 2E 00 01 60 1E

Among them, the data part 03 E8 is converted to decimal 1000, that is, the data acquisition interval is set to 1000ms.

8.1.5 Communication baud rate

Request command:

Device address	Function code	Starting address	Register count	Data length	Data	CRC
0x7F	0x10	0x20 02	0x00 01	0x02	0x25 80	0xB4 E2

Data definition: Communication baud rate: 4800,9600,19200.

Reply data:

Device address	Function code	Starting address	Register count	CRC
0x7F	0x10	0x20 02	0x00 01	0xA1 D7

Examples:

Request: 7 f 10 20 00 02 01, 02, 25 80 B4 E2

Reply: 7F 10 20 02 00 01 A1 D7

The data part 25 80 means that the communication baud rate is set to 9600.

8.2 Query instruction: Function code 0x03

8.2.1 From the machine address

Request command:

Device address	Function code	Starting address	Register count	CRC
0x7F	0x03	0x20 01	0x00 01	0xD4 14

Reply data:

Device address	Function code	Data length	Data	CRC
0x7F	0x03	0x02	0x00 01	0x51 8E

Data definition: value range 1--247.

Examples:

Request: 7 f 03 01 00 20 01 D4 14

Reply: 7 f 03 02 0 01 51 8 e

The data part 00 01 means that the slave address is 1.

8.2.2 Range ability

Request command:

Device address	Function code	Starting address	Register count	CRC
0x7F	0x03	0x20 46	0x00 02	0x24 00

Reply data:

Device address	Function code	Data length	Data	CRC
0x7F	0x03	0x04	0x00 00 41 30	0x54 70

Data definition: The data value is Float data, the unit is meters, the data length value is 4 bytes, the data format is low 16 bits of data in the front, high 16 bits of data in the back.

Examples:

Request: 7 46 f 03 20 00 00 02 24

Reply: 7 f 03 04 00 00 41 30 54, 70

The data part 00 00 41 30 is converted to floating point data, which is 11 meters.

8.2.3 Baud rate of communication

Request command:

Device address	Function code	Starting address	Register count	CRC
0x7F	0x03	0x20 02	0x00 01	0x24 14

Reply data:

Device address	Function code	Data length	Data	CRC
0x7F	0x03	0x02	0x28 80	0x8D 7E

Examples:

Request: 7 f 20 00 02 03 01 24 14

Re: 7F 03 02 25 80 8B 7E

The data part 28 80 means the communication baud rate is 9600.

8.2.4 Measure the time interval

Request command:

Device address	Function code	Starting address	Register count	CRC
0x7F	0x03	0x20 2E	0x00 01	0xE5 D0

Reply data:

Device address	Function code	Data length	Data	CRC
0x7F	0x03	0x02	0x03 E8	0x90 F0

Data definition: Set the time interval of water level meter data collection, unit ms, and the minimum value is 100ms.

Examples:

Request: 7F 03 20 2E 00 01 EF C3

Reply: 7 f 03 02 90 F0 03 E8

Among them, the data part 03 E8 was converted to decimal 1000, indicating that the data acquisition interval was 1000ms.

8.2.5 Query measurement results

Request command:

Device address	Function code	Starting address	Register count	CRC
0x7F	0x04	0x0A 0F	0x00 02	0x48 0E

Reply data:

Device address	Function code	Data length	Data	CRC
0x7F	0x04	0x04	0x04 19 3F 9E	0x25 2C

Data Definition: Data value is Float type data, the unit is meters. Data length value is 4 bytes, data format for the low 16 bits of data in the former, high 16 bit data behind. The meaning of the measurement result is associated with the type of measurement, and the default is the water level.

Examples:

Request: 7 4 0 f a 48 0 0 f 00 02 e

Reply: 7 f 04 04 04 19 3 f 9 e 25 2 c

The data part 04 19 3F 9E is converted to floating point data that is 1.2345 meters.

19049 e3f, in one place, with right high position.

8.2.6 Query version

Request command:

Device address	Function code	Starting address	Register count	CRC
0x7F	0x03	0x20 04	0x00 02	0x48 14

Reply data:

Device address	Function code	Data length	Data	CRC
0x7F	0x03	0x04	0x20 23 05 12	0x1D 63

Data definition: The data is in BCD encoding format, 0x20 0x23 0x05 0x12, which means data 20230512.

8.2.7 Broadcast address query devices

Request command:

Device address	Function code	Starting address	Register count	CRC
0xFF	0x03	0x20 01	0x00 01	0xCB D4

Reply data:

Device address	Function code	Data length	Data	CRC
0x7F	0x03	0x02	0x00 7F	0xD1 AE

Data definition: 0x7F in the data is the 485 address of the device.