

Radar Level Sensor

JW-RD-300R(HJ02)



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Contents

1. Product introduction	4
1.1 Brief introduction	4
1.2 Instrument features	4
1.3 Basic measurement principle	4
1.4 Technical specifications	5
1.4.1 Equipment characteristics	5
1.4.2 Electrical characteristics	6
1.4.3 Cables	6
2. Serial port connection description	6
2.1 Wiring	6
2.2 Setting	7
2.3 Cable mode description	7
2.3.1 Normal operation	7
2.3.2 Timing sleep	7
3 Item installation	7
3.1 Structure	7
3.2 Size	8
3.3 Plug install	8
3.4 Field mounted	8
3.4.1 Item install	8
3.4.2 Position choose	9
4. Serial communication protocol	10
4.1 Modbus-RTU communication protocol	10
4.1.1 Modbus-RTU transmission mode	10
4.1.2 Modbus-RTU data model	11
4.1.3 Modbus-RTU Common function code	11
4.1.4 Cyclic redundancy check(CRC)	12
4.1.5 Abnormal communication response	14
4.1.6 Terminal resistance	15
5. Equipment commissioning	15
5.1 Device address	15
5.2 Noise threshold	16
5.3 Filter times	16
5.4 Measurement time	16
5.5 measurement result	16
6. Register list	18
7. Technical parameter	19
8. Guarantee	20
8.1 Defects liability period	20
8.2 Warranty coverage	20
9. Fault analysis	20
10. Appendix: Packing List	21

JW-RD-300R(HJ02) USER MANUAL

☆ Cautions and restrictions

Note: The products are designed and manufactured safely and reliably. Please use them correctly (in accordance with the text shown) and fully observe the following precautions, it will not cause harm to the instrument and the human body.

Legend:

⚠ Instructions: Attention / Warning

Please refer to the precautions during transportation, use, and maintenance.

Things to note are as follows:

☆ Operating environment and power considerations

⚠ Warning: do not use this instrument in places with or possibly with flammable and explosive gases.

⚠ Note: do not touch or put the instrument into the water.

⚠ Note: Do not place the instrument in extreme temperatures and avoid static electricity.

☆ Instrument operation

⚠ Note: Regardless of the use, storage or transportation of the instrument, it should be handled with care and not damaged.

⚠ Note: The installation and setting of this radar level meter can only be installed and operated by professional technicians.

⚠ Note: Please do not open or modify the radar level meter, otherwise the warranty will be invalidated.

⚠ Note: If the instrument fails, please be sure to submit it to after-sales maintenance, do not disassemble it without permission!

☆ RS232 interface, RS485 interface

⚠ Warning: The system equipment or computer equipment connected to the RS232 interface or RS485 must comply with the BS EN60950 / IEC950 standard.

☆ Instrument parts

⚠ WARNING: This instrument is not equipped with spare parts and must not be disassembled without authorization.

☆ Statement

⚠ The design of the product meets and adheres to the requirements of the low voltage index.

1. Product Introduction

1.1 Brief introduction

JW-RD-300R(HJ02) radar level transmitter is using pulse coherent radar (PCR) technology, it has higher measurement accuracy, lower power consumption and ultra-small volume compared with traditional pulse radar level transmitter.

Using 60G submillimeter radar wave as carrier signal, it has the characteristics of high accuracy, small volume and energy saving, and the measurement process is not affected by temperature, air pressure and mud Sand, dust, river pollutants, floating objects, air and other environmental factors; the optimized algorithm makes the measurement results more accurate and stable.

This product has three standard physical circuit interfaces: RS485 / RS232 / wireless, 4-20mA; the equipment adopts standard Modbus RTU protocol, 4G, NB-IOT; in order to meet the personalized needs of customers, the company also provides customized protocol. The wireless data transmission function (optional) of this product can be selected in the harsh environment with difficult wiring.

This manual details the use and maintenance of BGT-RD101 radar water level meter.

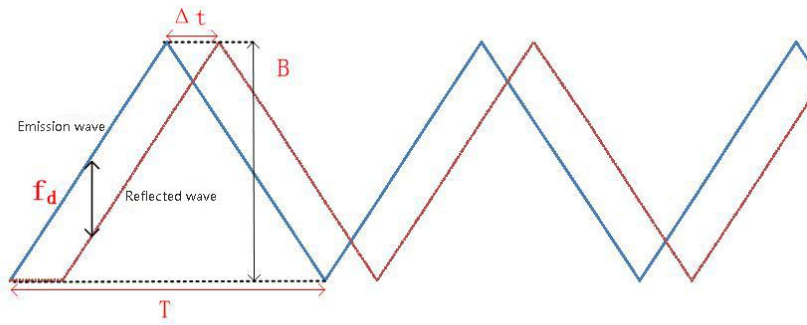
1.2 Instrument features

- Product specification: 56x56x64.2 (mm), weight less than 300g, it can use infrastructure such as bridge or auxiliary facilities such as cantilever; range 0.2~7m
- Wide power supply range of 7-32vdc, solar power supply can also meet the demand
- With low power consumption mode, the current is less than 0.5mA under 12V power supply
- Non-contact measurement, not affected by ambient temperature and humidity, and not corroded by water body
- Various working modes: cycle, sleep, automatic

1.3 Basic measurement principle

JW-RD-300R(HJ02) radar level transmitter adopts FMCW modulation mode, with triangle wave as modulation signal. The working process is as follows: firstly, the voltage modulation circuit generates triangular wave voltage, which is input to VCO (voltage controlled oscillator) to generate electromagnetic wave with frequency change.

The frequency change of electromagnetic wave changes according to the regulation of modulation voltage. The electromagnetic wave emitted by the antenna generates echo after being reflected by the measured object. The electromagnetic wave is transmitted from the beginning to the target, and is reflected by the target and then returned to the antenna within a period of time. The transmitting frequency has changed. The radar antenna couples the echo signal and the transmitting signal to get the difference frequency signal. The range and speed information of the target is included in the frequency of the difference frequency signal. Because the difference frequency signal is very weak, it needs to be sent to the ADC (analog-to-digital converter) of the MCU through the pre amplification of the radar sensor and the processing of the filter circuit. The MCU uses FFT algorithm to divide. The frequency of difference frequency is obtained by analyzing the waveform collected by ADC. Finally, the distance from the measured target to the radar level transmitter is calculated by the derived formula.



The above figure shows the frequency time relationship between FMCW radar transmission and echo signal.

When the radar wave transmitting source and target are relatively stationary, the transmitting frequency bandwidth of radar is B , the time from transmitting to returning to radar antenna is ΔT , the frequency of triangle wave is f , and the frequency of difference frequency signal is f_d . The derivation is as follows: (S : distance from radar plate to target, T : period of triangular wave)

$$\Delta t = \frac{2S}{c_0}$$

$$T = \frac{1}{2f}$$

$$S = \frac{f_d C_0}{4fB}$$

In the above formula, C_0 is the speed of light, f is the frequency of modulation triangle wave, B is the radar sweep bandwidth, f_d is the differential frequency signal obtained by MCU analysis, so the only f_d can calculate the corresponding distance between radar plate and target.

1.4 Technical specifications

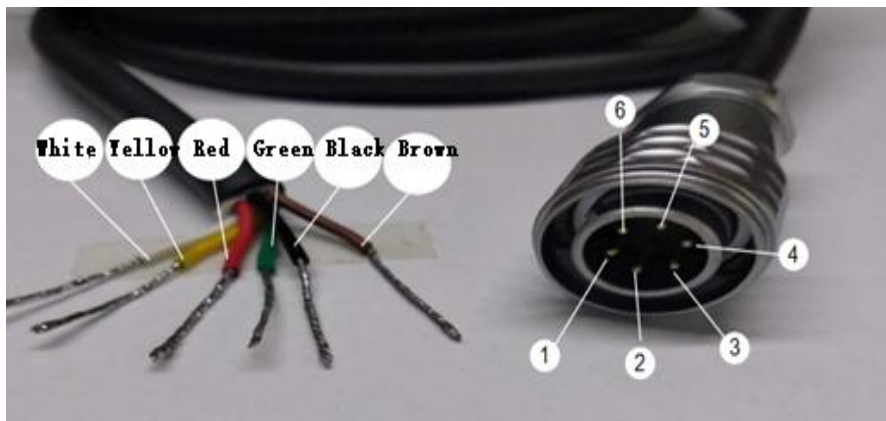
1.4.1 Equipment characteristics

1. Small size, high reliability, simple operation and convenient maintenance;
2. It is not affected by environmental factors such as temperature, sediment, dust, river pollutants, floating objects on the water surface, air pressure, etc;
3. It is used for non-contact water level measurement in open channel, river channel, irrigation channel, underground drainage pipe network, flood control and other occasions;
4. Non-contact measurement, convenient measurement, no pollution to the environment;
5. It has rainy day mode to prevent interference caused by rain;
6. The waterproof grade is IP68, which can effectively prevent the internal devices from getting damp;
7. Low power consumption, can use solar power supply, easy installation and maintenance free.
8. With pipeline mode, it is specially designed for underground drainage pipe network and other pipelines (refer to register list and software installation section).

1.4.2 Electrical characteristics

1. 7-32V power supply, wide power supply voltage facilitates the selection of power supply mode.
2. Low working current and standby current, solar power supply, convenient installation and maintenance free;
3. The lightning protection circuit can be 6KV. Thunderstorm days can effectively protect equipment from lightning;
4. High accuracy and stable data. Effectively ensure the accuracy of the test;
5. Support RS485, RS232, 4-20mA and other communication modes;
6. Support 4G, NB-IOT and other wireless communication modes (built-in option).

1.4.3 Cables

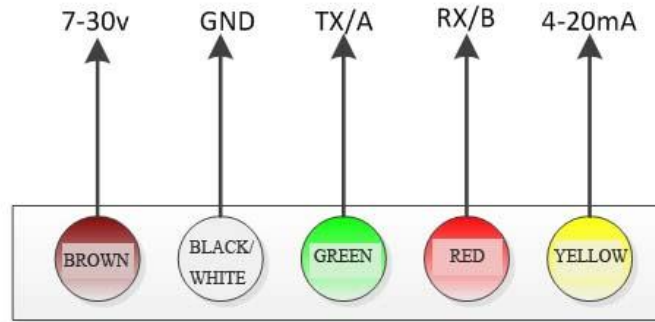


NUMBER	COLOR	DESCRIPTION
1	Brown	7-32V DC power supply
2	Black	GND
3	Green	TXD_A(232_TX/485_A)
4	Red	RXD_B(232_RX/485_B)
5	Yellow	IOUT(4-20mA positive, reserve)
6	White	IOUT(4-20mA negative, reserved)

2. Description of Serial Port Connection

2.1 Wiring

As shown in the figure below, brown line is the positive input of power supply, black / white line is GND line, TX (green) is the RS232 output interface or RS485 positive terminal of radar level transmitter, RX (red) is the RS232 input interface or RS485 negative terminal of water level gauge, the maximum transmission distance of RS232 communication interface is about 15m, the maximum transmission distance of RS485 interface is about 1.5km, and the yellow line is the positive terminal of 4-20mA (reserved).



Contrast diagram of connecting line color and signal

2.2 Setting

Communication format

Communication interface: RS485

Baud rate: settable (default 9600)

Check digit: NONE

Data bits: 8bit

Stop bits: 1

2.3 Cable mode description

JW-RD-300R(HJ02) radar level transmitter is compatible with standard MODBUS-

RTU communication protocol. Our company can also provide customized communication protocol, SDI (reserved).

There are two working modes of BGT-RD101 radar level transmitter: normal operation and timing sleep. The sleep time register is set to 0 when the device is in normal working mode, and when it is greater than 0, it will enter the timed sleep mode. After the device measurement is completed, it will sleep according to the set sleep time (minutes), and the sleep time will continue to be measured.

2.3.1 Normal operation

The radar level transmitter is in continuous working state, continuous sampling measurement, relatively high power consumption, return to the latest measurement results, fast response, good real-time performance.

2.3.2 Timing sleep

The radar water level indicator is in the sleep and non-sleep state, which is switched regularly. When the user inquires the water level gauge and returns the latest measurement value immediately, the power consumption is relatively low, and the water level can be detected for a period of time.

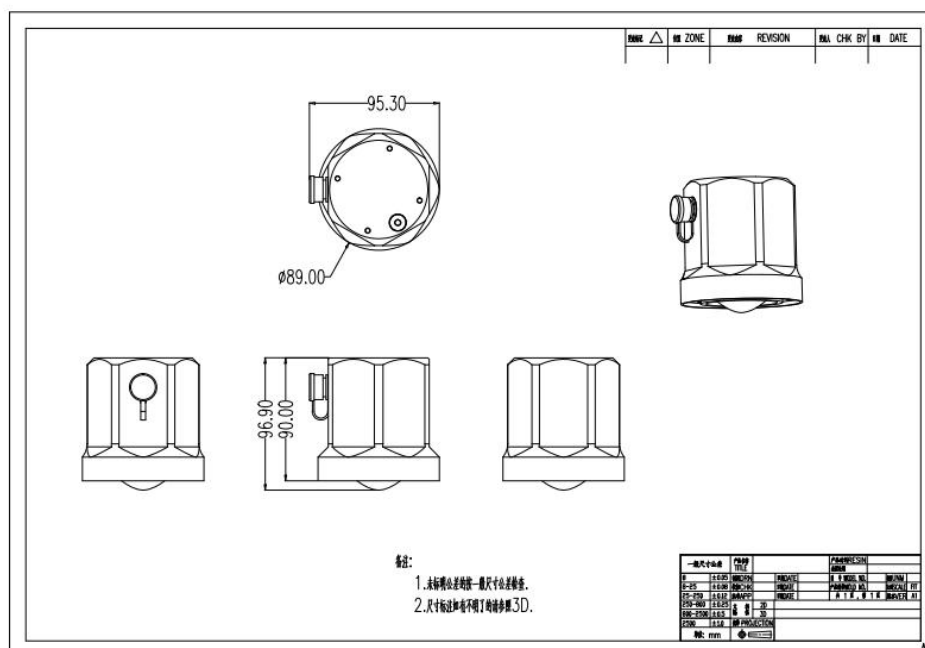
3. Item Installation

3.1 Structure

Appearance:



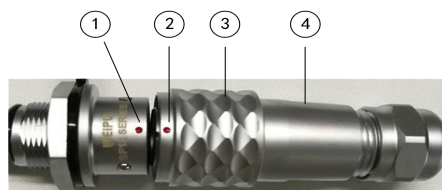
3.2 Size



The external dimension without antenna as shown above is 89x90(unit: mm)

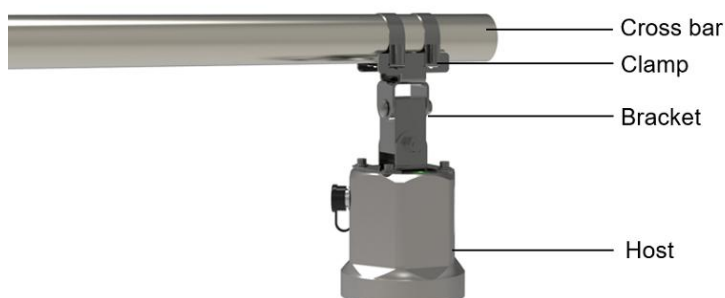
3.3 Plug install

As shown in the figure below, when the cable is inserted into the instrument, hold the position of cable ④. The red point ② of the cable plug is aligned with the red point ① of the instrument interface, and plug it in when you hear a snap. When unplugging, pull out the cable by holding the position ③ in the cable.



3.4 Field mounted

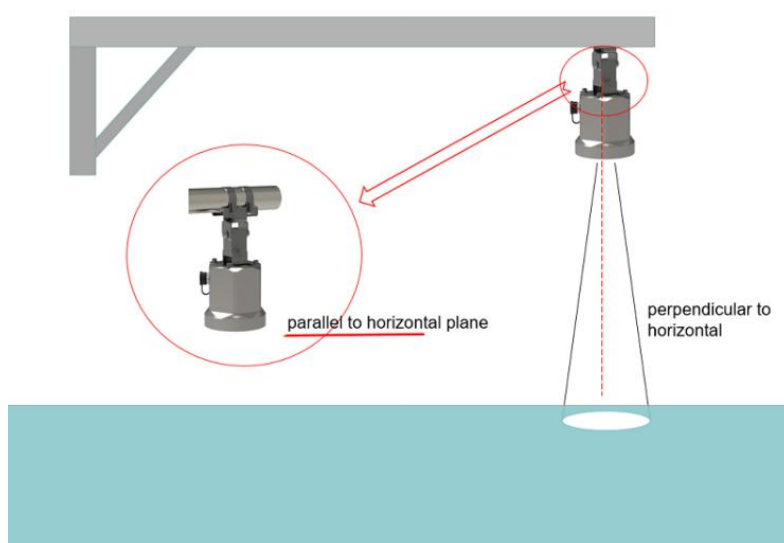
3.4.1 Item install



The installation direction is shown in the figure above. Three clamps fix the bracket and the instrument on the crossbar (diameter range of the crossbar: 40mm-85mm). During installation, keep the upper surface of the instrument and the river maintain standard.

3.4.2 Position choose

When selecting the installation site, it is necessary to ensure that the radar wave covers the water surface, avoid the influence of floating objects, whirlpools and aquatic plants, as well as avoid the siltation of the riverbed in low water period, and the main channel swing, which causes the radar wave to cover the ground and the measurement error. The coverage is approximately circular as shown in the figure below;



Installation diagram of radar level transmitter

The relationship between the diameter and distance of the circle is shown in the table below:

Install height(m)	Gauge coverage diameter range(m)
0.2	0.028
0.5	0.07
1	0.14
2	0.28
3	0.42
5	0.7
7	0.98

After installation, the radar detection plane of the water level gauge must be kept parallel to the horizontal plane. When installing, it is better to use reference tools and ensure that the installation height of the radar level transmitter is within the measurement range;

The selection of installation points should follow the following main principles:

- 1) The channel is straight, the channel foundation is fixed, the section is regular and stable, which is convenient for equipment installation;
- 2) The flow is smooth and uniform, and is not affected by vortex, gate opening and closing, and

backwater of canal system buildings;

3) The measuring section is perpendicular to the flow direction;

4) There shall be no buildings, trees or weeds that affect the flow near the section, and they shall not be affected by the discharge when they are downstream of the building;

4. Serial Communication Protocol

The company provides four communication modes for BGT-RD101: RS232, RS485, wireless transmission (optional), 4-20mA (reserved). The default communication mode of the equipment is RS485.

The communication protocol includes standard Modbus RTU and class (customized).

4.1 Modbus-RTU communication protocol

Modbus protocol communication mode is single master / multi slave. Only the master station can issue a query. The slave station performs the processing required by the query and replies the response information.

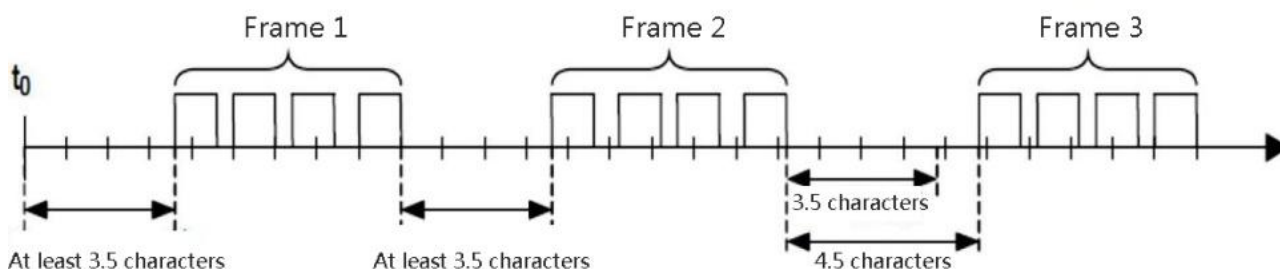
4.1.1 Modbus-RTU transmission mode

When the device uses RTU (remote terminal unit) mode to communicate on Modbus serial link, each 8-bit byte in the message contains two 4-bit hex characters. The main advantage of this mode is high data density and higher throughput than ASCII mode at the same baud rate. Each message must be transmitted in a continuous character stream.

Frame description:

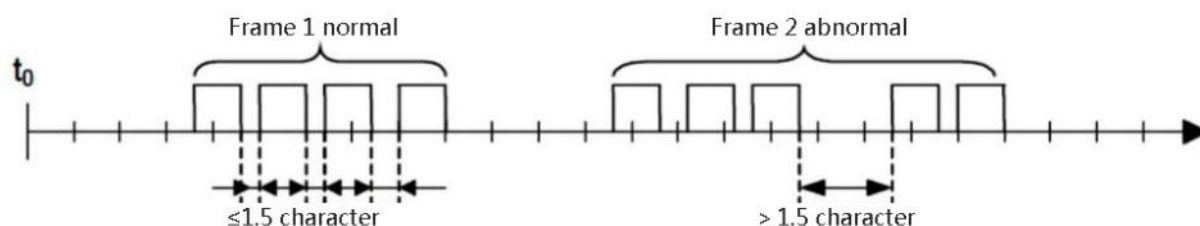
Device address	Function code	Data	CRC
1 byte	1byte	0~252 byte	2 byte
			CRC low CRC high

Message frame is distinguished by idle interval of at least 3.5 characters, which is called t3.5. This module uses standard t3.5 as idle interval. The diagram of RTU frame transmission idle interval is as follows



If the idle interval between two characters is greater than 1.5 character time, the message frame is considered incomplete and should be discarded by the receiving node. This idle time is called t1.5, and

the standard t1.5 time is used in this module. The schematic diagram of RTU frame transmission determination abnormal frame idle interval is as follows



4.1.2 Modbus-RTU data model

Modbus is based on a series of data models with different characteristics. The two basic models used by the equipment are as follows:

Register type	Object type	Access type	Content
Input register	16-bit	Read only	I/O system provides this type of data
Holding register	16-bit	Read and write	Change this type of data through the application

4.1.3 Modbus-RTU Common function code

	Function code name	Function code
16 bit access	Read input register	0x04
	Read holding register	0x03
	Write single register	0x06
	Write multiple registers	0x10

4.1.3.1 Read holding register (0x03)

The current value of read holding register 0x0007 baud rate.

Request message

Slave address	Function code	Register address	Number of registers	CRC check value
80	03	00 07	00 01	E7 DA

Response message

Slave address	Function code	Bytes	Register value	CRC check value
80	03	02	00 01	E7 DA

Note: The current baud rate value is 1 (9600bps).

4.1.3.2 Read input register (0x04)

The value of input voltage of read input register 0x0005.

Request message

Slave address	Function code	Register address	Number of registers	CRC check value
80	0x04	00 05	00 01	3F DA

Response message

Slave address	Function code	Bytes	Register value	CRC check value
80	0x04	02	00 78	85 0C

Note: The current input voltage value is 0x0078 (to convert 0x0078 to decimal 120, and then reduce it by ten times, i.e. $120 / 10 = 12V$).

4.1.3.3 Write single holding register (0x06)

Set the baud rate of holding register 0x0007 in slave address 0x80 to 0x01 (9600bps).

Request message

Slave address	Function code	Register address	Register value	CRC Check value
80	06	00 07	00 01	E7 DA

Response message

Slave address	Function code	Bytes	Register value	CRC Check value
80	06	00 02	00 01	E7 DA

Note: The current input voltage value is 0x0078 (to convert 0x0078 to decimal 120, and then reduce it by ten times, i.e. $120 / 10 = 12V$).

4.1.3.4 Write multiple holding registers (0x10)

Set the noise threshold value of water level gauge in holding register 0x0004 in slave address 0x80, keep the distance from water level gauge 0x0006 to the bottom of water channel as 0x64 (it is necessary to convert 0x64 to decimal 100, and then reduce it by 100 times, i.e. $100 / 100 = 1.0m$), and keep register 0x0008 device address as 0x01.

Request message

Slave address	Function code	Starting address	Number of registers	Bytes	Register value	CRC Check value
80	10	00 08	00 03	06	00 01 00 64 00 64	E7 DE

Response message

Slave address	Function code	Starting address	Number of registers	CRC Check value
80	10	00 08	00 03	1F DB

4.1.4 Cyclic redundancy check(CRC)

CRC is the most commonly used error check code in the field of data communication. Its characteristic is that the length of information field and check field can be arbitrarily selected (CRC-16 check code according to the standard MODBUS convention is used).

Use of CRC-16 check code:

According to the Modbus protocol, the information sending form of conventional RS485 communication is as follows:

Address	Function code	Data information	CRC Check value
1byte	1byte	n byte	2byte

The receiver uses the same calculation method to calculate the check code of the information field and compares it with the actual check code received. If it is equal, the information is correct, and if it is not equal, the information is wrong.

*pucFrame is the first address of the data to be verified, and uslen is the length of the data to be verified. The return value is the verification result.USHORT usMBCRC16(UCHAR * pucFrame, USHORT usLen)

13

```

0x2D, 0xED, 0xEC, 0x2C, 0xE4, 0x24, 0x25, 0xE5, 0x27, 0xE7, 0xE6, 0x26,
0x22, 0xE2, 0xE3, 0x23, 0xE1, 0x21, 0x20, 0xE0, 0xA0, 0x60, 0x61, 0xA1,
0x63, 0xA3, 0xA2, 0x62, 0x66, 0xA6, 0xA7, 0x67, 0xA5, 0x65, 0x64, 0xA4,
0x6C, 0xAC, 0xAD, 0x6D, 0xAF, 0x6F, 0x6E, 0xAE, 0xAA, 0x6A, 0x6B, 0xAB,
0x69, 0xA9, 0xA8, 0x68, 0x78, 0xB8, 0xB9, 0x79, 0xBB, 0x7B, 0x7A, 0xBA, 0xBE, 0x7E, 0x7F, 0xBF, 0x7D, 0xBD,
0xBC, 0x7C, 0xB4, 0x74, 0x75, 0xB5, 0x77, 0xB7, 0xB6, 0x76, 0x72, 0xB2, 0xB3, 0x73, 0xB1, 0x71, 0x70,
0xB0, 0x50, 0x90, 0x91, 0x51, 0x93, 0x53, 0x52, 0x92, 0x96, 0x56, 0x57, 0x97, 0x55, 0x95, 0x94, 0x54, 0x9C,
0x5C, 0x5D, 0x9D, 0x5F, 0x9F, 0x9E, 0x5E, 0x5A, 0x9A, 0x9B, 0x5B, 0x99, 0x59, 0x58, 0x98, 0x88, 0x48, 0x49,
0x89, 0x4B, 0x8B, 0x8A, 0x4A, 0x4E, 0x8E, 0x8F, 0x4F, 0x8D, 0x4D, 0x4C, 0x8C, 0x44, 0x84, 0x85, 0x45, 0x87,
0x47, 0x46, 0x86, 0x82, 0x42, 0x43, 0x83, 0x41, 0x81, 0x80, 0x40
};

```

4.1.5 Abnormal communication response

When the master sends a request to the slave, the master wants to get a normal response. The inquiry of the master station may lead to one of the following four events:

- If the slave receives a request without communication errors and can normally process the query, the slave will return a normal response.
- If the slave does not receive a request due to a communication error, the response cannot be returned. The master program will be processed as a timeout.
- If a request is received from the slave but a communication error is detected (parity, CRC), the program that cannot return to the calling master will be treated as timeout.
- If the slave device receives a request without communication errors, but cannot process the request (for example, if the request reads an input register that does not exist), the slave will return an exception response informing the client of the cause of the error.

Exception code	Exception name	Description
01	Illegal function code	Unrecognized function code, not within 0x00-0x0f
02	Illegal data address	Data address out of definition
03	Illegal data value	Value other than register storage
04	Slave failure	Generate a non retrievable error

The abnormal response message has two different fields from the normal response message:

Function code field: in normal response, the function code of the original request is assigned to the function code field of the slave station in response. All function code MSBS are 0 (their values are lower than hex 80). In the abnormal response, the MSB of the function code set by the slave station is 1. This makes the function code value in the abnormal response higher than that in the normal response by hexadecimal 80.

By setting the function code MSB, the application program of the master station can identify the abnormal response and detect the data field of the abnormal code. **Data field:** in a normal response, the slave can return data or statistics (any information required in the request) in the data field.

In the exception response, the exception code is returned from the station in the data field. This explains the cause of the exception. The exception response message of all supported function codes is function code plus 0x80.

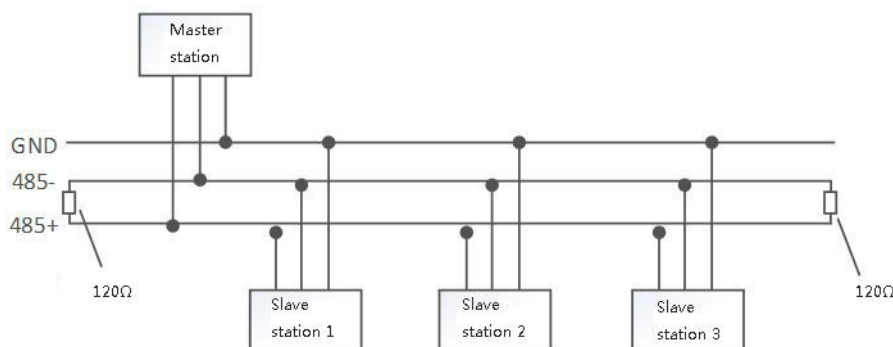
All abnormal function codes are 0x83, 0x84, 0x86, 0x88, 0x90 and 0x97.

The abnormal response message corresponding to function code 0x06 is as follows:

Slave address	Function code	Exception code	CRC Check value
80	86	01	D3 88

4.1.6 Terminal resistance

In the process of network construction, if the network is terminated and embedded to connect other MODBUS devices, 120Ω terminal matching resistance needs to be connected at the end of the network.



5. Equipment commissioning

5.1 Device address

The device address can be set from 1 to 200 by setting the value of holding register address 0x001c. The factory default slave address is 0x80. Save automatically after the slave address is set successfully.

Example of setting the device address to 0x01

Request message sent

Slave address	Function code	Register address	Register value	CRC Check value
80	06	00 08	00 01	D7 D9

Response message sent

Slave address	Function code	Register address	Register value	CRC Check value
80	06	00 08	00 01	D7 D9

When the device address is forgotten, the device address can be specified as 0xff, and the real address of the device can be obtained by querying the register address 0x001c with Modbus protocol 03 function code. Using this method to query the device address, only one device can be connected to MODBUS.

Example of querying device address

Request message sent

Slave address	Function code	Register address	Register value	CRC Check value
FF	03	00 08	00 01	10 16

Response message sent

Slave address	Function code	Bytes	Register value	CRC Check value
80	03	02	00 80	85 FA

Note: The register value 0x0080 in the response message is the real address of the device.

5.2 Noise threshold

Noise threshold is used to set the threshold of signal extraction. If the signal strength of equipment (obtained by input register) is lower than the set value, it is considered that noise is not picked up. Generally, this item does not need to be adjusted. According to the factory default, the signal is weak when the installation distance is long. It needs to be adjusted according to the field signal strength. The threshold setting of water level gauge should not be less than 400. The register for setting the water level meter noise threshold is 0x0004.

Example of setting the noise threshold of water level gauge to 500

Request message sent (response message is the same as request message)

Slave address	Function code	Register address	Register value	CRC Check value
80	06	00 04	01 F4	D6 0D

5.3 Filter times

The larger the filtering times, the smaller the numerical fluctuation, the more stable the measurement results and the weaker the real-time performance. General default. Set the register of filter times of water level gauge to 0x0005.

Example of setting filter times of water level gauge to 5

Request message sent (response message is the same as request message)

Slave address	Function code	Register address	Register value	CRC Check value
80	06	00 05	00 05	47 D9

5.4 Measurement time

1. High signal strength: a stable value will be measured in about 30s.
2. Signal strength is relatively weak: Although the time of the measured results is longer (2min), the measurement performance of low flow rate is high and the obtained results are stable.

5.5 measurement result

The measurement results are saved in the holding register and the input register, and can be read through the Modbus protocol 0x03 or 0x04 function code (it is recommended to use 0x04 function code to read the input register). Read the relevant registers through the debugging assistant (such as MODBUS debugging assistant). Note that the value read at this time is hexadecimal, so it needs to be converted to decimal for the convenience of calculation. For example, to query the water level, the value read from the 0x0001 register is 0x7b, and the conversion from 0x7b to decimal is 123. At this time, to get the actual water level, you need to reduce it by 1000 times (0.123m). It should be noted that the

values stored in the register are magnified values (the "description" column in the table below describes that the values stored in the register are magnified), so the extracted values should be reduced by the corresponding multiple. (Note: the waiting time for each query command is 100ms)

Function	Register address	Unit	Description
Water level	0x0001	m	Magnified 1000 times
Air height	0x0002	m	Magnified 1000 times
Water level signal strength	0x0003	/	/
Water level meter noise threshold	0x0004	/	/
Filter times of water level gauge	0x0005	/	/
Distance from water level gauge to bottom of water tank	0x0006	m	Magnified 1000 times
Serial port baud rate	0x0007	/	/

Read through 0x04 function code, input register address as follows

Function	Register address	Unit	Description
Water level	0x0001	m/s	Magnified 1000 times
Air height	0x0002	m	Magnified 1000 times
Water level signal strength	0x0003	m	Magnified 1000 times
Fault information	0x0004	/	Reserve
input voltage	0x0005	/	Magnified 1000 times
Version No	0x0006	/	/

Note: In order to deal with the decimal part, the water level and air height are enlarged. After reading the value, it needs to be reduced. For example, if the reading water level is 1000, the real water level is 1m.

Example of reading single input register by 0x04 function code (reading water level)

Request message sent

Slave address	Function code	Starting address	Number of registers	CRC check value
80	04	00 01	00 01	7E 1B

Response message

Slave address	Function code	Bytes	Register value	CRC Check value
80	04	02	0B B0	83 AA

0x04 function code can read multiple continuous registers, and read all measurement results through 0x04 function code

Request message sent

Slave address	Function code	Starting address	Number of registers	CRC check value
80	04	00 01	00 09	7F DD

Response message

Slave address	80
Function code	04
Data bytes	1A
water level	00 7B
Empty height	00 7B
Water level signal strength	07 D0
Water level meter noise threshold	01 F4
Filter times of water level gauge	00 05
Distance from water level gauge to bottom of water tank	00 64
Fault information	00 00
input voltage	00 78
CRC check value	/

6. Register List

List of Holding Registers

Add. Hex	Name	Description	Data range	Default value	Read write status
01	Water level	Unit: m/s Enlarge the velocity by 1000 times	0~65535	0	Read only
02	Air height	unit: m Enlarge the air height by 1000 times	0~65535	0	Read only
03	Water level signal strength	Current signal strength of water level	0~65535	0	Read only
04	Water level meter noise threshold	Water level meter noise threshold	0~65535	500	Read only
05	Filter times of water level gauge	Set filter times of water level gauge	0~65535	5	Read and write
06	Distance from water level gauge to bottom of water	unit: m Support decimals, write after 100 times magnification	0~65535	0	Read and write
07	Serial port baud rate	0x01: 9600 0x02: 19200 0x03: 56000 0x04: 115200	1~4	1	Read and write
08	Device address	Set / read device address	1~200	0x80	Read and write
09	Sleep time	unit: min Sleep time after single measurement cycle	0~65535	0	Read and write
0A	Fault information	reserve	-	-	-

0B	input voltage	unit: V Input voltage value after 10 times amplification	0~65535	0	Read only
0C	Software version number	Software version number High 8-bit plus low 8-bit combination For example, 0x0102 corresponds to version number v1.2	0~65535	0	Read only
0D	Restore factory settings	0x01: restore factory default settings	0~1	0	Read and write
0F	Pipeline mode	0x01: Pipeline mode 0x02: Non pipeline mode	1~2	1	Read and write

Input register list

Add. Hex	Name	Description	Data range	Default value
01	Water level	Unit: m Enlarge the water level by 1000 times	0~65535	0
02	Air height	Unit: m Enlarge the air height by 1000 times	0~65535	0
03	Water level signal strength	Current signal strength of water level	0~65535	0
04	Fault information	reserve	-	-
05	input voltage	Unit: V Input voltage value after 10 times amplification	0~65535	0
06	Software version number	Software version number High 8-bit plus low 8-bit combination For example, 0x0102 corresponds to version number v1.2	0~65535	0

7. Technical Parameter

Type	3m	7m/10m/20m/30m/40m
Level measurement		
Measure range	0.2-3m	0.2-10m/20m/30m/40m
Accuracy	±2mm / ±1mm	±2mm
Radar antenna	Planar microstrip pulse coherent radar	Planar microstrip array antenna
Sleep time	0 – 24h, Settable	0 – 24h, Settable
Radar frequency	60GHz	80GHz
Radio emission angle	8°	8°
Other parameters		
Power supply range	7-32V DC	
Digital interface	RS485/RS232,4G/433MHz(Wireless Optional)	

Analog output	4-20mA	
12Vpower consumption	Working mode, $\leq 10\text{mA}$; Low power (sleep) mode, $\leq 0.5\text{mA}$	Working mode, $\leq 30\text{mA}$; Low power (sleep) mode, $\leq 1\text{mA}$
Shell material	Aluminum alloy shell	
Protection Level	IP68	
Working temperature	$-40^{\circ}\text{C}-85^{\circ}\text{C}$	
Storage temperature	$-40^{\circ}\text{C}-85^{\circ}\text{C}$	
Lightning protection	Lightning protection level 6KV	

8. Guarantee

The supplier guarantees that the JW-RD-300R(HJ02) instrument has no defects in performance and quality when it is sold.

For problems in the use process, it can repair or replace the abnormal instrument under the correct use conditions according to different situations.

Please contact the supplier before repairing the instrument. The returned products must be packed in good condition to ensure that the instrument will not be damaged during transportation.

8.1 Defects liability period

The free warranty period for users is one year (from the date of purchase). For instruments beyond the warranty period, the company will provide paid maintenance.

8.2 Warranty coverage

During the warranty period, the company will only repair the products with faults under the correct use conditions free of charge.

Faults caused by the following conditions are not covered by the warranty:

- Beyond the warranty period;
- Failure to use and maintain the product in accordance with the requirements of the product manual, resulting in damage;
- Damage caused by the dismantling (unauthorized dismantling) of the machine by a repairer
- Other non quality fault caused by natural disaster, mechanical damage, etc.

9. Fault analysis

1. Q: Why didn't the upper computer receive any data?

Answer:

- 1) check whether the power supply voltage is 7-32vdc, and power on again after confirmation;
- 2) check whether the communication mode, serial port number and baud rate are correct;
- 3) Check whether the communication protocol operates according to the instructions and whether the instructions are correct;
- 4) Whether the device is in the low power consumption mode or not requires the upper computer to send instructions to wake up and transmit in the low power consumption mode.

2. Q: Why is the measurement always zero?

Answer:

- 1) Confirm whether the radar transmitting probe is vertically aligned with the measuring target;
- 2) Whether the measurement distance is within the reasonable range of probe test.

3. Q: Why do measurements jump frequently and dramatically?

Answer:

- 1) Check whether the power supply voltage is too low;
- 2) Whether there are obstacles within the measurement range;
- 3) Whether the probe is installed firmly and whether the radar wave is perpendicular to the horizontal plane

4. Q: Why is the measurement stable for a long time without any fluctuation?

Answer:

- 1) Check whether the water surface is frozen due to season;
- 2) Check whether the measurement is inaccurate due to the radar wave covering the ground caused by the low water period or the main trough swing.

5. Q: Rd Lite radar wave water level measurement system software cannot be connected with water level gauge.

Answer:

- 1) By default, the water level gauge adopts RS-485 interface, and check whether the RS-485 receiver is used for receiving;
- 2) Check whether the serial port number of the equipment is correct;
- 3) The default device address of water level gauge is 0x80, and whether the device address is set to 0x80;
- 4) Whether the water level gauge is normally powered;
- 5) Click to start measurement.

10. Appendix: Packing List

Item	Unit	Quantity	Remark
Radar level sensor	PCS	1	
Plug		1	Standard 5 meters
Install bracket, screw and clamp	SET	1	
Product manual	PCS	1	PDF format