

76-81GHz Continuous Frequency Modulated Wave Radar Level Gauge
Installation Commissioning and Operation Manual



Preface

Thank you for purchasing our company's products.

This manual is an operation guide covering various functions of the product, wiring methods, setting procedures, operation methods, and troubleshooting techniques. For basic information about the product, please refer to the corresponding instruction manual.

Please read this manual carefully before operation. Use this product correctly to avoid personal injury and unnecessary losses caused by incorrect operation.

Note

If there are any software or hardware upgrades for the content of this manual, please refer to the newly released documents.

We have made every effort to ensure the accuracy of the content in this manual. If you find any errors, please contact us.

The content of this manual is strictly prohibited from being reprinted or copied.

Please use this product in accordance with the explosion-proof features and the national and regional laws and regulations.

The final interpretation right of this manual belongs to our company.

Safety Instructions

For safe use of this product, please strictly observe the safety precautions described here when operating.

About This Manual

Please hand this manual over to the operator for reading.

Before operation, please read this manual carefully and have a thorough understanding of the product.

This manual only describes the functions of the product. Our company does not guarantee that the product will be suitable for any specific use of the user.

Notes on protection, safety and modification of this product

To ensure the safe use of this product and the systems it controls, please strictly follow the instructions and precautions described in this manual during operation. If the operating procedures are violated, the protective functions provided by this product may be damaged. Our company assumes no responsibility for any quality, performance, functionality or safety issues arising from the above situations.

When installing lightning protection devices for this product and its control system or designing and installing a separate safety protection circuit for this product and its control system, it is necessary to rely on other equipment to achieve this.

If it is necessary to replace the components of the product, please use the models and specifications designated by our company.

This product is not suitable for systems directly related to personal safety, such as nuclear power equipment, devices using radioactive energy, railway systems, aircraft, marine equipment, aviation equipment and medical devices, etc. If it is applied, the user is responsible for using additional equipment or systems to ensure personal safety.

Do not modify this product.

The following safety signs are used in this manual:



Dangerous signs indicate that if appropriate preventive measures are not taken, serious personal injury, instrument damage or major property loss and other accidents may occur.



Warning signs alert you to pay special attention to important information about the product or specific sections of this manual.



Before connecting the power supply to this product, please confirm whether the power voltage of the instrument is consistent with the supply voltage. Please do not operate this device in places where there are flammable gases, explosive gases or steam. It is extremely dangerous to use this product in such an environment.

To prevent electric shock and accidental operation, it is essential to ensure proper grounding protection.

It is essential to properly implement lightning protection engineering facilities, including using a shared grounding network for equipotential grounding, shielding, rational wiring, and appropriate use of surge protectors, etc.

Some internal components carry high voltage. Non-authorized personnel from our company or those not approved by our company are requested not to open the front panel to avoid electric shock.

Before conducting any inspections, be sure to cut off the power supply to avoid electric shock accidents.

Please regularly check the condition of the terminal screws. If you find any of them loose, tighten them before putting the equipment back into use.

Under no circumstances should the instrument be disassembled, processed, modified or repaired without authorization, as this may cause abnormal operation, electric shock or fire.

Please wipe the instrument with a dry cotton cloth. Do not use alcohol, gasoline or other organic solvents. Be cautious of any liquids splashing onto the instrument. If the instrument falls into water, please cut off the power supply immediately; otherwise, there may be leakage of electricity, electric shock or even a fire.

Please regularly check the grounding protection status. If you think the grounding protection and fuse and other protective measures are not adequate, do not operate.

The ventilation holes on the instrument housing must be kept unobstructed to prevent malfunctions, abnormal operations, shortened service life and fires caused by high temperatures.

Please strictly follow all the instructions in this manual when operating; otherwise, the protective device of the instrument may be damaged.



If the instrument is found to be damaged or deformed upon opening the box, do not use it.

When installing, avoid letting dust, thread ends, iron filings or other substances enter the instrument; otherwise, abnormal operation or malfunction may occur.

During operation, if it is necessary to perform operations such as modifying the configuration, signal output, start-up, or stop, the safety of the operation should be fully considered. Incorrect operation may lead to damage to the instrument. The meter and the controlled equipment may malfunction or even get damaged.

The various components of the instrument have a certain service life. To ensure long-term use, regular maintenance and servicing are essential.

When discarding this product, handle it as industrial waste to prevent environmental pollution.

When not in use, please cut off the power supply.

If smoke is observed coming from the instrument, an unusual smell is detected, or abnormal sounds are heard, immediately cut off the power supply and contact our company promptly.

Disclaimer

For terms outside the scope of the warranty of this product, our company makes no guarantee.

The company shall not be held responsible for any damage to the instrument or loss of parts directly or indirectly caused by improper operation of the user, as well as for some unforeseeable damages.

Confirm the contents of the package.

After opening the packaging box, please confirm the contents before starting the operation. If you find any errors in the model or quantity, or if there is any physical damage on the appearance, please contact our company.

The contents of the product packaging are as listed in the standard configuration list.

Standard Configuration List

NO.	Name	QTY	Note
1	Radar level gauge	1	
2	Instruction Manual	1	
3	Certificate of Conformity	1	

Note: Customized products may slightly differ from standard ones. Please refer to your order for details.

Contents

Chapter One: Product Overview

1.1 Product Introduction	6
1.2 Measurement Principle	6
1.3 Product Features	6

Chapter Two Technical Parameters

Table 1 Technical Parameters	7
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Chapter Three Product Structure and Dimensions

3.1 Product Dimensions	8
3.2 Materials	10

Chapter Four Installation

4.1 Arrival Inspection	6
4.2 Installation Requirements	6

Chapter Five Operations

5.1 Operating Mode	13
5.2 Interface Description	13
5.3 Configuration Description	14

Appendix A Communication Protocol

A.1 Hardware Interface Parameters of Communication Protocol	31
A.2 Communication Protocol Format	31
A.3 Communication Protocol Format and Command Description for Communication Protocol	31
A.4 Examples of Communication	33

Chapter 7 Bluetooth App Operation Instructions	34
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Chapter One Product Overview

1.1 Product Introduction

This product is a Frequency Modulated Continuous Wave (FMCW) radar operating at (76~81) GHz, supporting both four-wire and two-wire applications. It comes in multiple models, with a maximum range of up to 85 meters and a blind zone as small as 15 cm. Due to its higher operating frequency and shorter wavelength, it is particularly suitable for solid applications. The method of transmitting and receiving electromagnetic waves through a lens gives it a unique advantage in high-dust and harsh temperature environments (+ 200°C). The instrument offers flange or threaded mounting options, making installation quick and easy.

1.2 Measurement Principle

The measurement of the radar is based on the principle of Frequency Modulated Continuous Wave (FMCW). The radar emits electromagnetic waves at the top of the tank. After hitting the medium, the waves are reflected and received by the radar. The frequency difference δf between the received signal and the transmitted signal is in a certain proportional relationship with the distance R from the medium surface: $R = C (\text{speed}) \cdot \delta f (\text{frequency difference}) / 2 / K (\text{frequency modulation slope})$. Since the speed of light C and the frequency modulation slope K are known, the distance R between the radar installation position and the material surface can be obtained by estimating the frequency difference δf . Then, by subtracting the space distance from the radar to the material surface (referred to as the empty height) from the total height H of the tank, the height of the material level can be obtained.

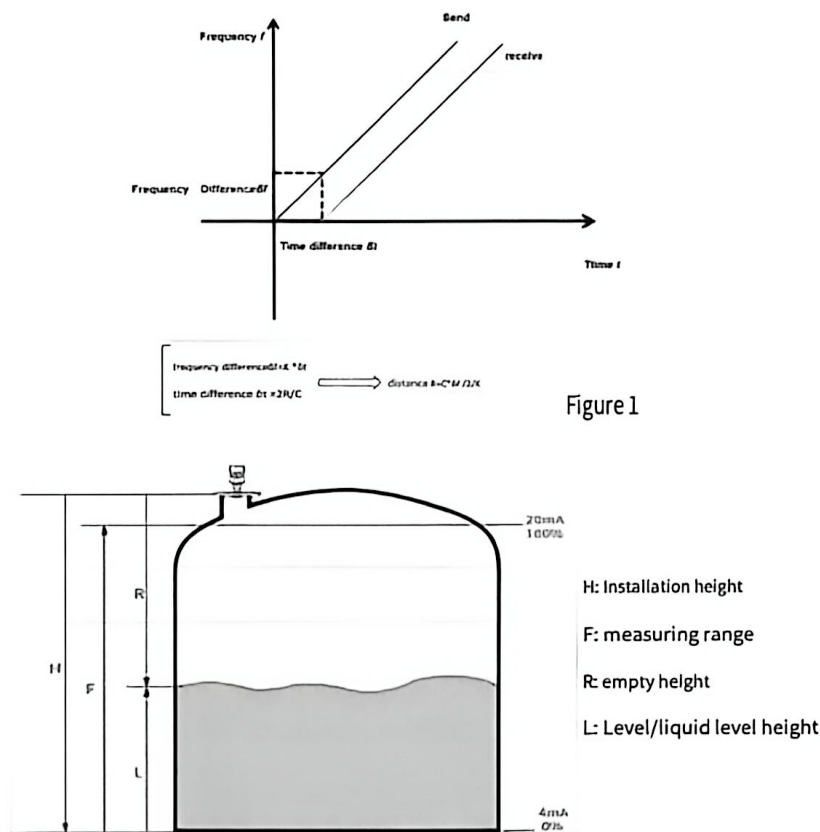


Figure 1 Measurement Principle of Radar Level Gauge

1.3 Product Features

The non-contact measurement method is adopted, and the sensor does not come into direct contact with the medium, thus avoiding corrosion and wear caused by the medium. The millimeter-wave radar has a measurement accuracy of up to $\pm 3\text{mm}$ and a minimum blind zone of 0.15m.

The 5GHz working bandwidth enables the product to have higher measurement resolution and accuracy.

The minimum 3. antenna beam angle reduces the impact of interference in the installation environment on the instrument and makes installation more convenient.

The Chinese display interface and menu options are easy to understand, facilitating more efficient human-machine interaction.

Chapter Two Technical Parameters

Table 1 Technical Parameters

Performance parameters	
measured variable	liquid level
Measurement range	(0~35) m
Blind spot	0.15m
Accuracy	±3mm
Beam angle	3°/ 8°
Transmission frequency	76GHz~81GHz
Output	
Transmitter output	(4~20) mA
Communication output	RS485 , MODBUS : HART
Wireless	Bluetooth
Electrical Specifications	
Power supply	Supply voltage: (18 - 28) VDC Power consumption: Max 1W (4-wire)
Electrical interface	M20×1.5
Recommended cables	AWG18 or 0.75mm²
Process conditions	
Dielectric constant	> 2
Process pressure	(-0.1~2) MPa
Medium temperature	-40—200℃
Environmental conditions	
working environment	Temperature: (-20 to 65)℃ Humidity: ≤ 95%RH
Storage environment	Temperature: (-40 to 60) °C, Humidity: ≤ 90%
Degree of protection	IP67

3.1 Product dimensions

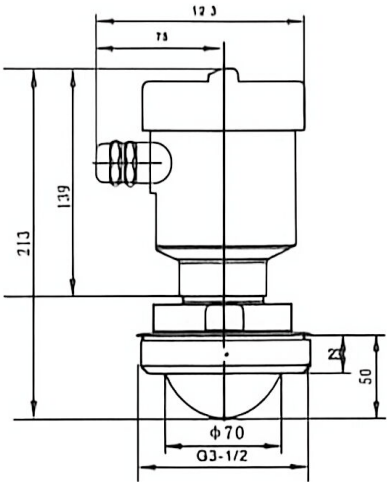
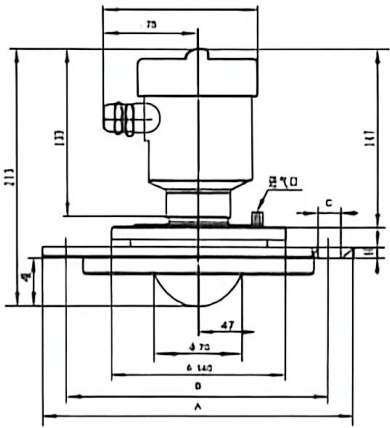
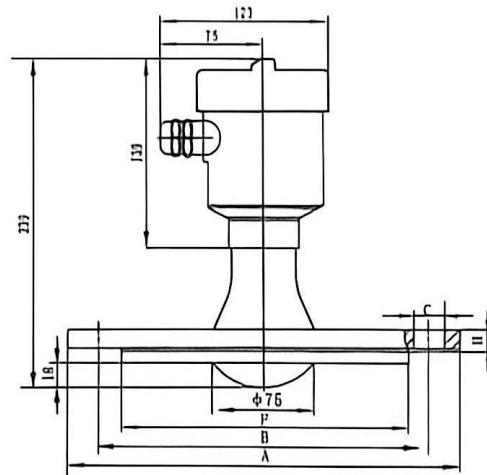


Figure 2: Outline dimensions of G3 1/2 pipe thread connection at normal temperature (Unit: mm) Thread size: 100X2.309mm



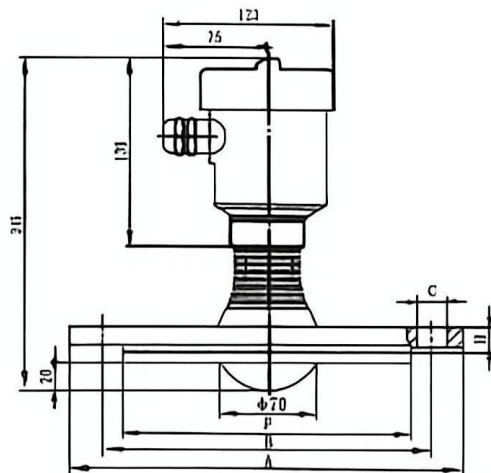
	A	B	C	H
DN80	$\phi 190$	$\phi 150$	4- $\phi 18$	18
DN100	$\phi 210$	$\phi 170$	4- $\phi 18$	18
DN125	$\phi 240$	$\phi 200$	8- $\phi 18$	20
DN150	$\phi 265$	$\phi 225$	8- $\phi 18$	20
DN200	$\phi 320$	$\phi 280$	8- $\phi 18$	22
Flange Standard PN6				

Figure 3: Outline Dimensions of Universal Flange Connection



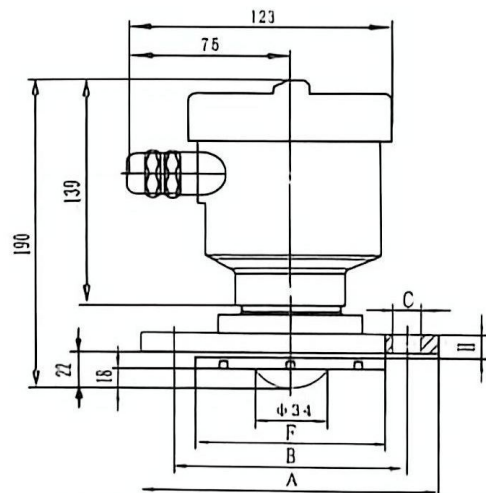
	A	B	C	F	H
DN80	φ190	φ160	4-φ18	φ128	18
DN100	φ210	φ170	4-φ18	φ148	18
DN125	φ240	φ200	8-φ18	φ178	20
DN150	φ265	φ225	8-φ18	φ202	20
DN200	φ320	φ280	8-φ18	φ258	22

Figure 4 Dimensions of the Flanged Anti-corrosion High-temperature Type (Unit: mm) Flange Standard: PN6



	A	B	C	F	H
DN80	φ200	φ160	8-φ18	φ138	20
DN100	φ220	φ180	8-φ18	φ158	22
DN125	φ250	φ210	8-φ18	φ188	22
DN150	φ285	φ240	8-φ22	φ212	24
DN200	φ340	φ295	12-φ22	φ268	26

Figure 5 Dimensions of Anti-corrosion Flange Connection for High Temperature and High Pressure (Unit: mm) Flange Standard: PN16



	A	B	C	F	H
DN50	φ140	φ110	4-φ14	φ90	16
DN65	φ160	φ130	4-φ14	φ110	16

Figure 6 Dimensions of Anti-corrosion Small Lens (Unit: mm) Flange

Standard: PN6

3.2 Material

Table 1 Materials

Shell	Heavy-duty cast aluminum
Antenna	304 stainless steel + polytetrafluoroethylene
Material Description	304 stainless steel: 06Cr19Ni10 steel is a general-purpose stainless steel material, and its rust prevention performance is better than that of the 200 series. The stainless steel material is stronger. It also performs well in terms of heat resistance, with a general upper limit of operating temperature of less than 650 °C. 304 Steel features excellent anti-rust and corrosion resistance, as well as good resistance to intergranular corrosion. In experiments, it shows remarkable resistance to oxidizing acids. It can be concluded that 304 steel has strong corrosion resistance in nitric acid with a concentration of no more than 65% and at a temperature below its boiling point. It also has good corrosion resistance to alkaline solutions and most organic and inorganic acids. Polytetrafluoroethylene: The standard number for polytetrafluoroethylene is GB/T 1040.3-2006. PTFE (Polytetrafluoroethylene), a colorless, transparent, odorless and non-sticky polymer, has excellent resistance to high temperatures. It has excellent thermal performance, chemical resistance, non-stickiness and insulation properties. Its application range is extensive and It can be used in the manufacture of Manufacture high-performance industrial products such as pipes, valves, pump bodies, seals, and cable insulation.

4.1 Goods Arrival Inspection

Upon receipt of the product, the user should first inspect the packaging quality. The packaging box should be intact and undamaged with clear markings. If there is obvious damage to the packaging, the user should promptly contact the storage and transportation department to clarify the issue and responsibility and notify our company. If there is no damage or other problems with the packaging, the box can be opened to take out the product and check the integrity of the product.

4.2 Installation Requirements

Two points to note during installation:

- Aim at the target material level and try to ensure vertical incidence on the material level.
- Avoid false echoes

The typical operating conditions are as follows:

- (1) Ensure that there are no obstructions within the beam range, such as ladders or steps.

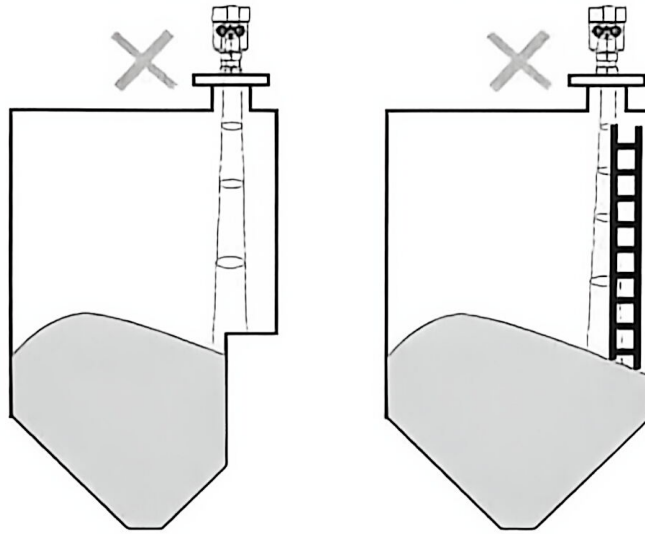


Figure 7 Schematic Diagram of Instrument Installation Position

- (2) The installation of the instrument should ensure that the antenna beam avoids the feed inlet.

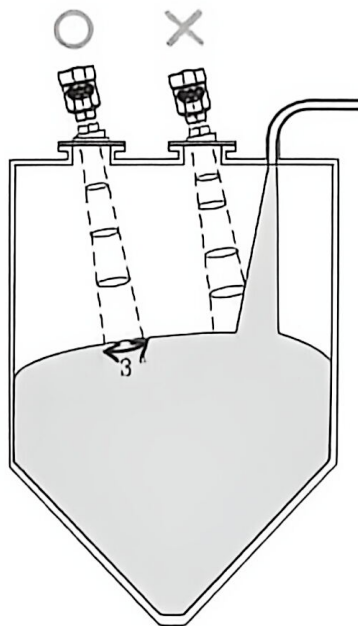


Figure 8 Antenna beam avoiding the feed inlet

(3) The instrument should be installed at least 20 cm away from the container wall; otherwise, incorrect readings are very likely to occur.

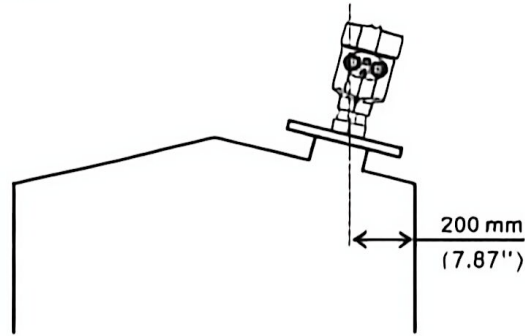


Figure 9

Install at least 20cm away from the container wall

(4) For conical containers, it is advisable to ensure that the beam is directed straight to the bottom of the tank; otherwise, the measurement result at the bottom of the tank may be inaccurate.

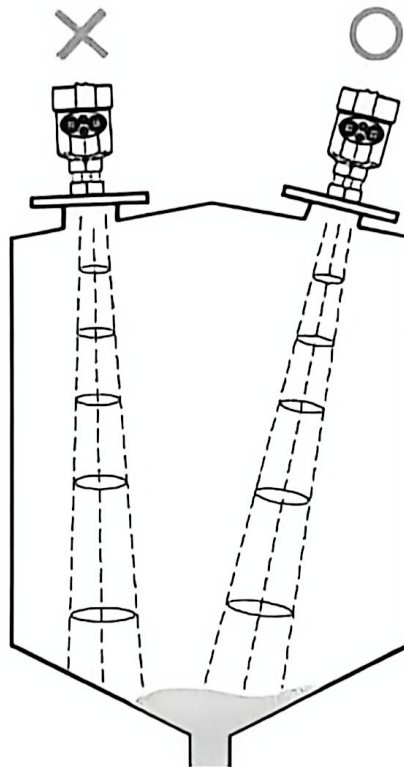


Figure 10: For the conical tank, efforts should be made to ensure that the beam is directed straight to the bottom of the tank.

5.1 Operation method

The product display module consists of 4 keys and a 128 × 64 dot matrix display screen.

The display system has five display interface modes:

【Run Mode (Operation Measurement Interface)】 : Displays the system operation status and current measurement data.

【Echo Mode Interface】 : Displays the current echo conditions measured by the system.

【Historical Curve Interface Memo Mode】 : Displays historical measurement data of the system operation records.

【Setup Mode】 : Set various data parameters for system operation.

【Input Mode】 : Enter the values of parameters, which can be numbers or characters.

The functions of the four keys vary in different display modes. For details, please refer to the interface description in Section 6.2.

5.2 Interface Description

5.2.1 Instructions for the Operation Measurement Interface

Run the measurement interface, which displays as follows:



Figure 11 Schematic Diagram of the Running Measurement Interface

Table 2 Function Description of Keys When Running the Measurement Interface

key	Instructions
BK	The echo curve parameters page is displayed
△	/
↺	/
OK	The parameter setting page is displayed

5.2.2 Explanation of the Echo Curve Interface

In the operation measurement interface, press the [BK] key to enter the echo interface, as shown in the following figure:

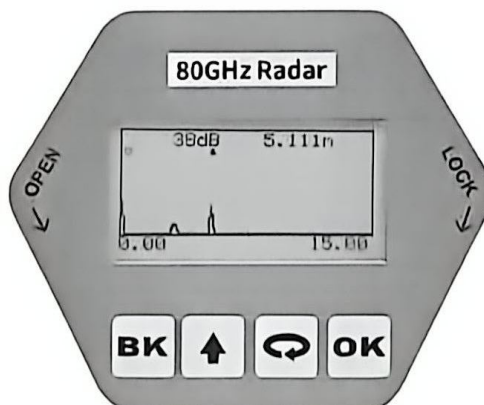


Figure 12 Schematic Diagram of Echo Curve Interface

Note: 188 dB indicates the maximum echo intensity within the range. For a good metal reflector, the echo intensity should be around 220 dB. If the echo intensity is low

At 70 dB, It indicates that the echo signal is weak and requires technicians to conduct corresponding troubleshooting.

Table 3 Function Description of Echo Interface Keys

key	Instructions
BK	Return to measurement interface
△	/
↺	Show or hide the threshold curve
OK	Switch to the running measurement interface

5.2.3 Parameter Setting Interface Instructions

In the measurement operation interface, press [OK] to switch to the parameter setting interface, as shown in the following figure:

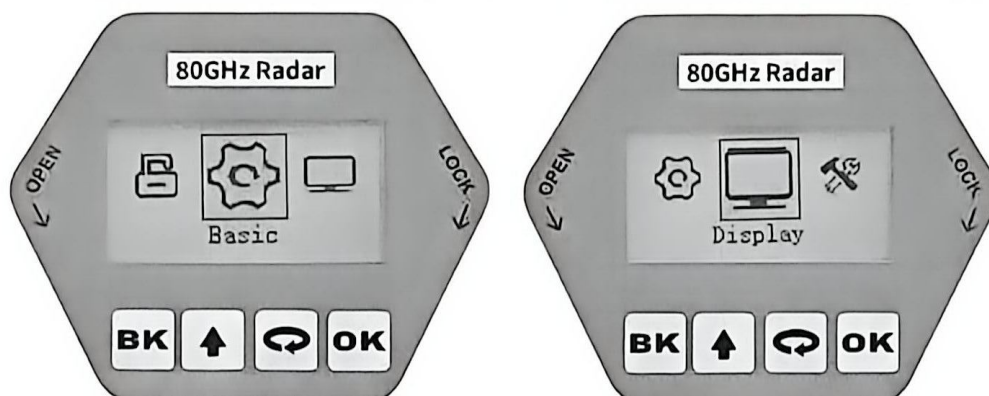


Figure 13 Schematic Diagram of the Parameter Setting Interface

Table 4 Function description of the buttons in the parameter setting

Button	Description
BK	Switch to the operation measurement interface
△	Move up to select the item
↺	Move down to select the item
OK	Enter the sub-Interface of the selected item

(1) Basic Settings

The Basic Settings menu enables multiple functions. By setting these parameters, the liquid level gauge can be started up quickly. Select [Basic Settings] and press [OK] to enter the option interface.

The basic setting options include: low-level setting, high-level setting, range setting, blind zone setting, damping time, medium type, medium parameters, and application scenarios.

(2) Advanced Settings

Select [Advanced Settings], then press [OK] to enter the options interface.

Advanced settings options include: false echo learning, distance offset, bus address, MODBUS baud rate, output position, current simulation, and current function.

(3) Service Settings

Select [Service Settings], then press [OK] to enter the options interface.

The service settings options include: Echo Index, Echo Ratio, Window Settings, Echo Lock, First-stage Filtering, Second-stage Filtering, Response Rate, Threshold Setting, and Factory Reset.

(4) Display Settings

Select [Display Settings], then press [OK] to enter the options interface.

The display settings options include: measurement mode, measurement unit, language, and LCD contrast.

(5) Manufacturer Settings

Select [Factory Settings], then press [OK] to enter the password screen. Enter the password 1000.

The manufacturer's setting options include: transmission power, reception power, hardware filter, current offset, position detection, upsampling, downsampling, echo algorithm, confidence level, merge width, clutter intensity, first

wave range, low wave range, smoothing factor, matching similarity, matching distance, correction unit, drop wave time, and operation, Mode, working cycle, and retention time.

(Do not adjust this Item without the guidance of the manufacturer's technical personnel.)

5.3 Configuration Instructions

5.3.1 Basic Settings Menu Operations

(1) Low-level adjustment

Press [] to enter the basic menu option [Low Position Adjustment].

【Low-level Setting】 When the value corresponding to the low-level setting is $\leq$ the empty height, the corresponding output is 4mA. Adjusting the low-level setting will directly affect the liquid level height displayed on the interface.

In the "Basic Settings" menu, select "Low Position Adjustment", press the "OK" key to enter "Low Position Adjustment". Press the "OK" key to complete the editing operation, and press the "BK" key to exit.

【Low Position Setting】 The low position corresponds to the position of an empty warehouse, as shown in the following figure.



(2) High-level adjustment

Press [] to enter the basic menu option [High Position Adjustment].

【High and Low Level Settings】 When the value corresponding to the high level setting is $\geq$ the empty height, the corresponding output is 20mA.

In the "Basic Settings" menu, select "High Position Adjustment", press the "OK" key to enter "High Position Adjustment". Press the "OK" key to complete the editing operation, and press the "BK" key to exit.

【High Position Setting】 The high position corresponds to the full position, as shown in the following figure.

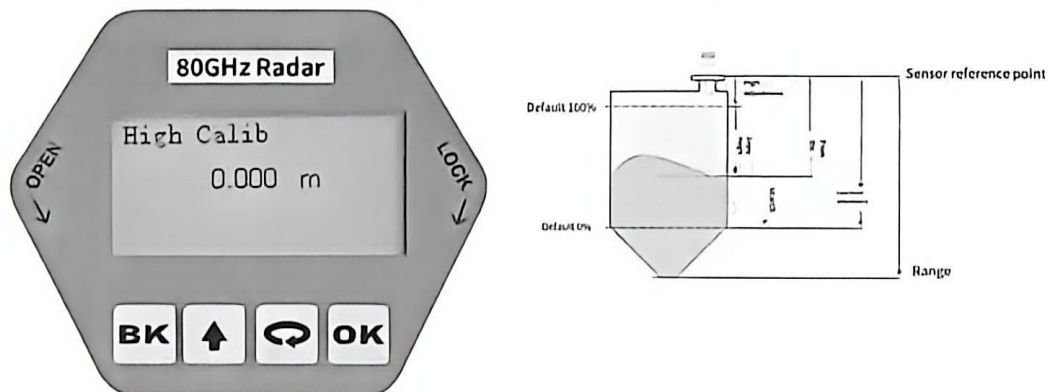


Figure 14 Interface and Definition for High and Low Position Adjustment Editing

(3) Range Setting

Press [] to enter the basic settings menu option [Range Setting]

To obtain accurate measurement results, It is necessary to set the range of the Instrument. Select the 【Basic Settings】 menu and enter the 【Range Setting】 option. If you need to modify the value, press the 【OK】 key to edit. Press the 【BK】 key to exit when the operation is complete



Table 15 Range Description

Table 5 Range Description

Parameter name	range
Parameter range (m)	1~35
Default value (m)	35
Related configuration	(1) Dead zone: If the set range value is less than (dead zone + 0.5), the range will be automatically set to (dead zone + 0.5). (2) 4mA corresponding position: When the current output function is distance, the 4mA corresponding position and the range correspond and are modified simultaneously. The setting relationship is: $\text{dead zone} + 0.5 \leq \text{range}$.
Meaning of Options	Echo areas beyond the measurement range are not selected.
Special Matters	no

(4) Blind Spot Settings

Enter the "Basic Settings" menu, select "Blind Spot Setting", and press the "OK" button to enter the option to edit the blind spot range. The display will be as follows. If you need to modify the values, complete the operation according to the keyboard menu editing



Figure 17 Blind Spot Setting Interface

Table 6 Explanation of Blind Zones

Table 6 Explanation of Blind Zones

Parameter name	Blind spot
Parameter range (m)	0 to (full scale - 0.5)
Default value (m)	0
Related configuration	If the value of the blind zone is greater than (range - 0.5), the blind zone will be automatically set to (range - 0.5).
Meaning of Options	Echo areas smaller than the blind zone are not selected.
Special Matters	no

(5) Damping time

To enhance the stability of the measurement output value, a larger 【Damping Time】 can be set to achieve a stable measurement value and increase the anti-interference ability.

For instance, if the damping time is set to 2 seconds and the position of the measured object undergoes a step change at time t, the measurement output value will follow the actual position of the measured object after 10 seconds. Enter the 【Basic Settings】 menu, select 【Damping Time】 , and press [OK]. The display will be as shown in the following figure:

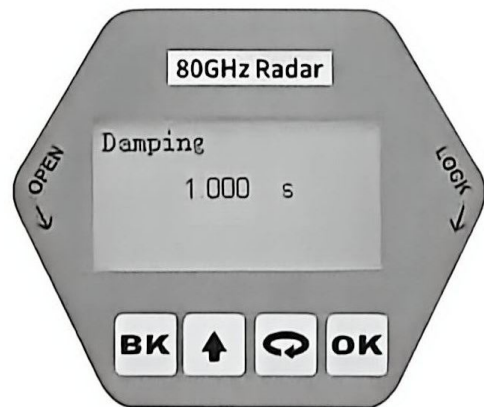


Figure 18 Damping Time Setting Interface

Damping time description

Parameter	Damping time
Parameter range (S)	0~ 100
Default value (S)	5
Related configuration	None
Option meaning	Damping output, Improve signal stability
Special matters	None

(6) Medium Type

Enter the "Basic Settings" menu, select "Medium Parameters", and press the "OK" button to enter the medium parameter selection menu. For liquids, select the dielectric constant, and for solids, select the material shape.



Figure 19 Interface for Setting Medium Type

(7) Medium Paramoters

Enter the "Basic Settlings" menu, select "Medium Parameters", and press the "OK" button to enter the medium parameter selection menu. For llquids, select the dielectric constant, and for solids, select the material shape.

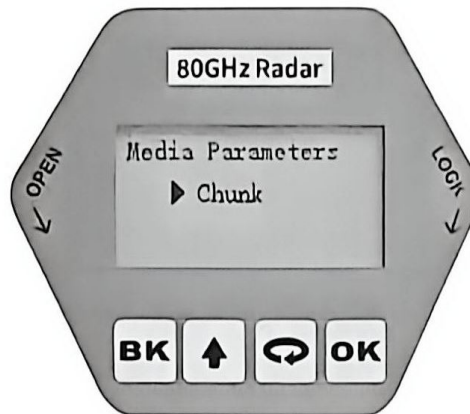


Figure 20 Interface for Setting Medium Parameters - Liquid/Solid

Table 8

Parameter name	Medium parameters
Parameter range (S)	>0
Default value(s)	3-10 / Small pieces
Associated configuration	no
Meaning of Options	Modify according to thedielectric constant of the medium / the shape of the material
Special Matters	no

(8) Application scenarios

Enter the "Basic Settings" menu, select "Application Scenario", and press the "OK" button to enter the application scenario selection menu.

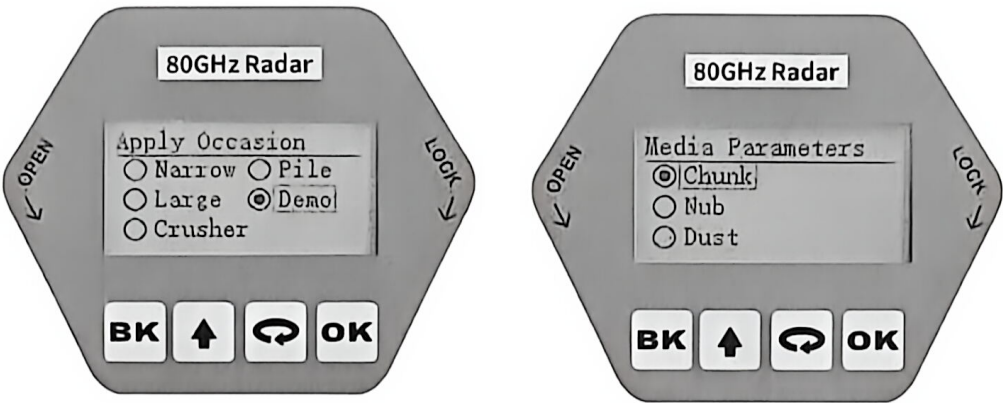


Figure 21 Application Scenario Setting Interface - Liquid/Solid

Table 9

Parameter name	Application scenarios
Parameter range	Small container / Medium container / Large container / Stir / Demonstration Narrow and tall type / Large capacity / Crusher / Pile of materials / Demonstration
Default value	Medium-sized container / Large
Related configuration	capacity no
Meaning of Options	Small containers: suitable for small containers Medium container: Suitable for horizontal tanks and medium-sized containers Large containers: suitable for warehousing and large containers Stirring: Applicable to stirred tanks and large fluctuation measurements Demonstration: Debug mode, not suitable for on-site measurement. Narrow and tall type: suitable for closed packaging hoppers Large capacity: large storage tanks or upright tanks Crusher: Irregular container shape and large fluctuations in material level Material pile: conical material pile or large-area shed storage
Special Matters	no

5.3.2 Advanced Settings Menu Operations

(1) False echo learning

Press the 【OK】 button to enter the basic settings menu bar, then press 【↺】 to enter the 【Advanced Settings menu. Press the 【OK】 button again to enter the 【False Echo Learning】 settings.

【False Echo Learning】 can learn the false echoes contained in the container with known obstacles and form a screening curve (threshold curve) for background noise. Before learning the false echoes, the 【Threshold Mode】 and 【Threshold Area】 need to be set. Press the 【OK】 key to complete the editing operation.

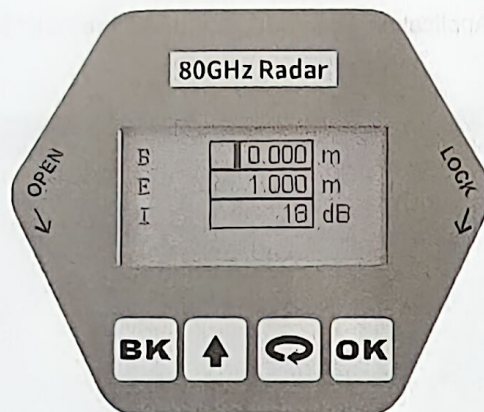


Figure 22 False Echo Learning Interface

Schematic diagram before false echo learning:

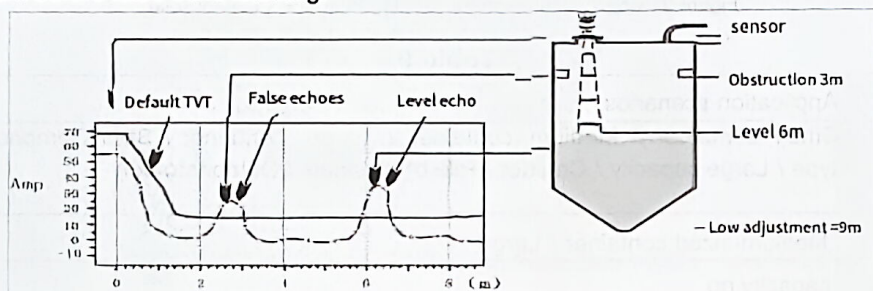


Figure 23 Schematic Diagram of False Echo Before Learning

Schematic diagram after learning of false echo:

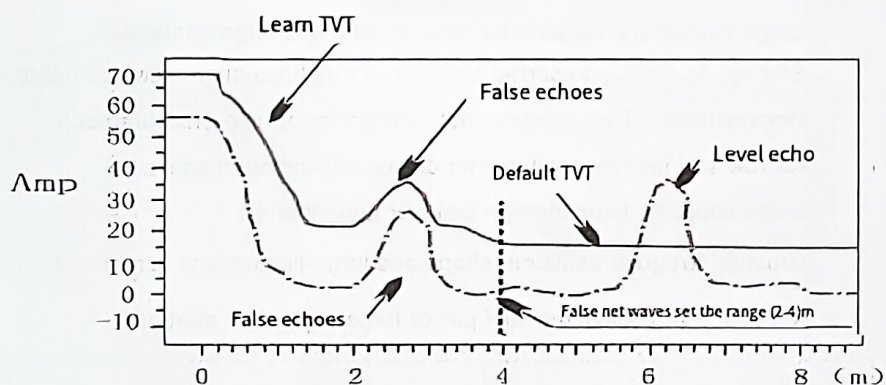


Figure 24 Schematic Diagram of False Echo after Learning

(2) Distance offset

Press the [↶] key to enter [Distance Offset].

Set the [Distance Offset] to correct the deviation between the ideal measurement value and the actual measurement value. It has been set before leaving the factory. Press the [OK] key to complete the editing operation and press [BK] to exit. The display is as follows:



Figure 25 Distance Offset Setting Interface

(3) Bus Address

Press the [↶] key to enter the [Bus Address] mode.

This function is used to modify the bus address for HART and MODBUS communication. Press the [OK] key to edit. After the operation is completed, press the [BK] key to exit. The display is as follows:

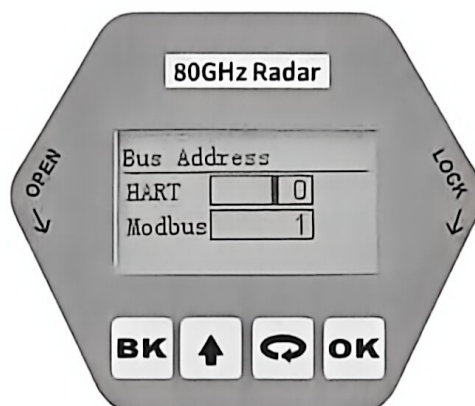


Figure 26 Bus Address Setting Interface

(4) MODBUS baud rate

Press the [↶] key to enter [MODBUS Baud Rate].

According to the customer's requirements, select the direction of the [Baud Rate], press the [OK] key to complete the editing operation, and press the [BK] key to exit.

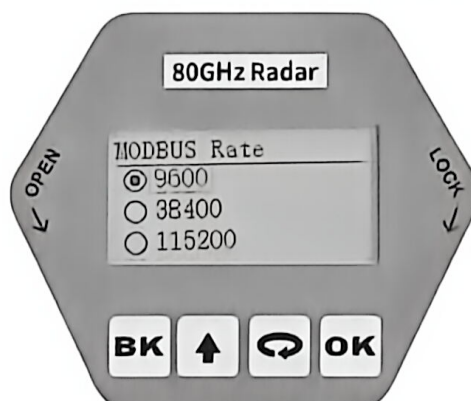


Figure 27 MODBUS Baud Rate Setting Interface

(5) Output mode

Press the [↶] key to enter the [Output Mode].

According to the customer's requirements, select the direction of the [Current Output Mode], press the [OK] key to complete the editing operation, and press the [BK] key to exit.

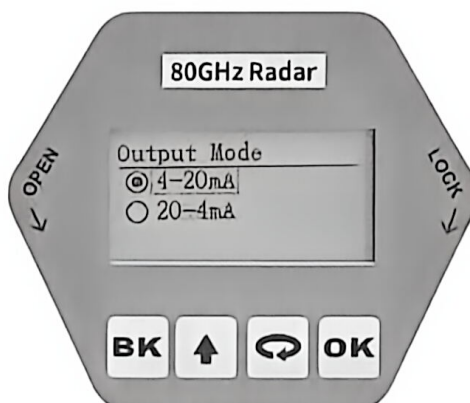


Figure 28 Output Mode Setting Interface

(6) Current Simulation

Press the [↶] key to enter [Current Simulation].
Set [Current Simulation] to calibrate the error value of the current output. It has been calibrated before leaving the factory.
Press [OK] to complete the editing operation and press [BK] to exit. The display is as follows:

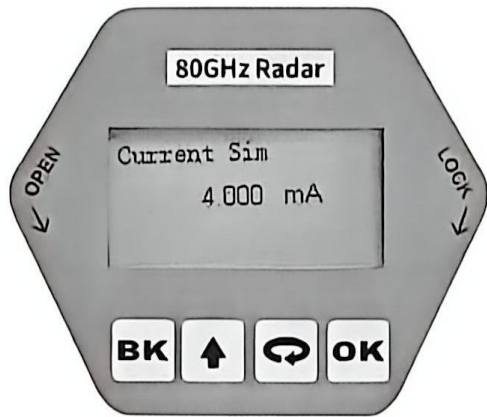


Figure 29 Current Simulation Settings Interface

(7) Current function

Press the [↶] key to enter the [Current Function].
Set the [Current Function], which allows you to define the actual output current value when the instrument encounters a packet loss fault. Press the [OK] key to complete the editing operation and press [BK] to exit. The display will be as follows

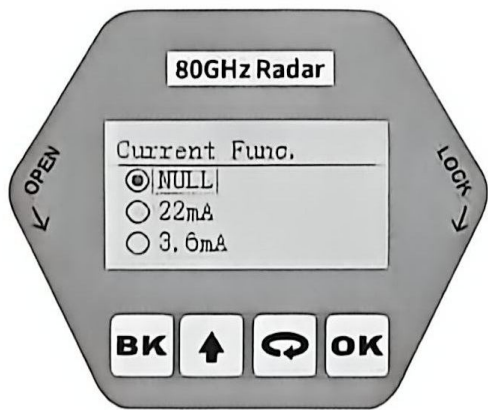


Figure 30 Current Function Setting Interface

5.3.3 Service menu operation

(1) Echo Index

Press the [↺] key to enter the [Echo Index] mode.

【Echo Index】 is used to adjust the speed of waveform change. The larger the value, the slower and more stable the waveform change; conversely, the smaller the value, the faster the waveform change speed. Press the 【OK】 key to complete the editing operation, and press the 【BK】 key to exit. Display as follows:

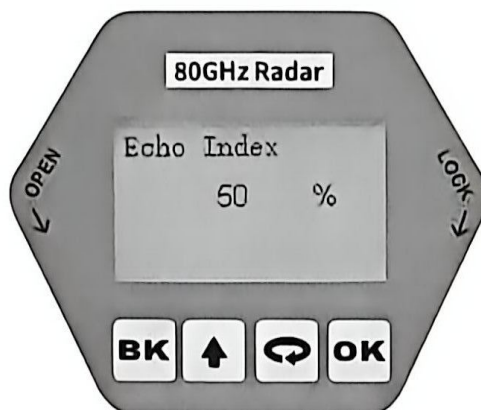


Figure 31 Echo Index Setting Interface

(2) Echo ratio

Press [↺] to enter the service settings menu option [Echo Ratio].

The window shows the percentage of the echo that is greater than the echo within the window. Select the [Service] menu and enter the [Echo Ratio] option. If you need to modify the value, press the [OK] key to complete the editing operation. Press [BK] to exit

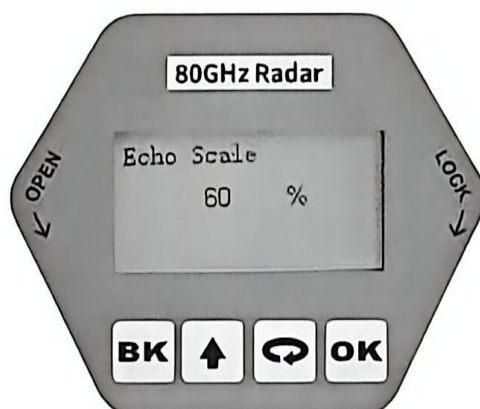


Figure 32 Echo Ratio Setting Interface

(3) Window Settings

Press the [↻] key to enter [Window Settings].

【Window Settings】 Is used to set the range for searching before and after the locked waveform. After the current echo is locked, It will search for the strongest echo within the set range value before and after. If the current echo is lost or the feeding and discharging speed is too fast and the echo is not tracked, It will search the entire range for the strongest echo and confirm the current echo. If the previously lost echo is restored, It will not confirm the previously lost echo. The time is the speed of the arrow tracking. Press the 【OK】 key to complete the editing operation, and press 【BK】 to exit. Display as follows:

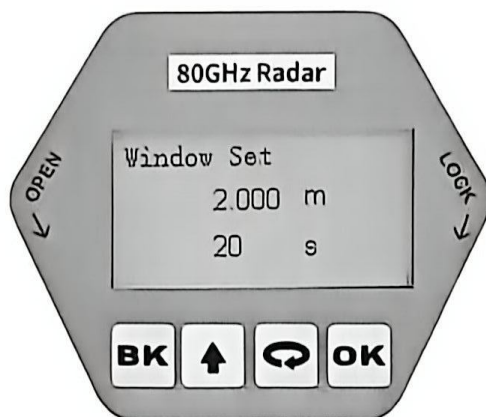


Figure 33 Window Settings Interface

(4) Echo Locking

Press the [↻] key to enter [Echo Lock] mode.

【Echo Lock】 If you choose to lock, the signal will be sought within the window range (the window range here refers to the parameters set in the previous window). If you choose to unlock, the signal will be sought throughout the entire process. Press the 【OK】 key to complete the editing operation, and press the 【BK】 key to exit. The display is as follows.

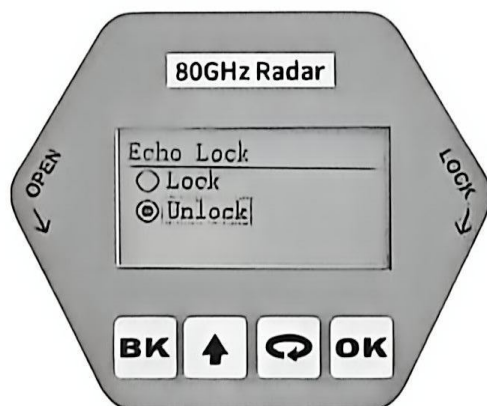


Figure 34 Echo Locking Settings Interface

(5) Primary filtering

Press the [↻] key to enter [Primary Filtering].

【Primary Filtering】 In a small-scale measurement environment, It can be enabled or disabled based on the waveform.

Press the 【OK】 key to complete the editing operation and press the 【BK】 key to exit. The display is as follows:

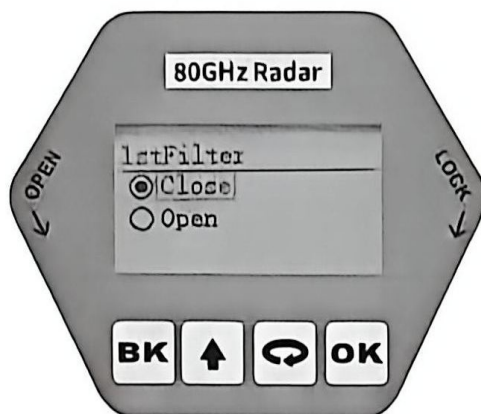


Figure 35: First-level Filter Settings Interface

(6) Secondary Filtering

Press the [↻] key to enter the [Secondary Filtering] mode.

【Secondary Filtering】 is a feature of interface filtering that can be enabled or disabled based on the waveform in a large-scale measurement environment. Do not use it if the blind zone is required to be too small. Press the 【OK】 key to complete the editing operation and press the 【BK】 key to exit. The display is as follows:

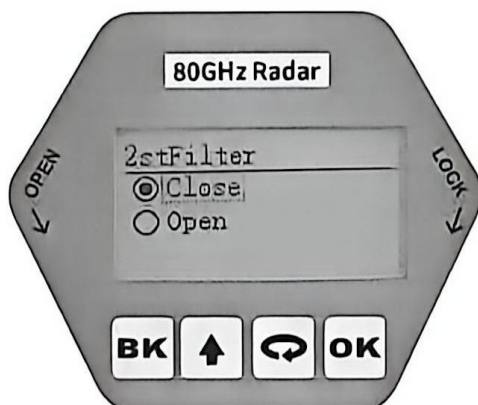


Figure 36: Secondary Filter Settings Interface

(7) Response rate

Press the [↻] key to enter [Response Rate]

【Response Rate】 Is used to adjust the Instrument's response rate to the actual increase in material level. When the rate and time settings are changed, the response rate will automatically change. Generally, the rate setting for solids is slightly larger, and for liquids, it is slightly smaller. Press the 【OK】 key to complete the editing operation, and press the 【BK】 key to exit. Display as follows:

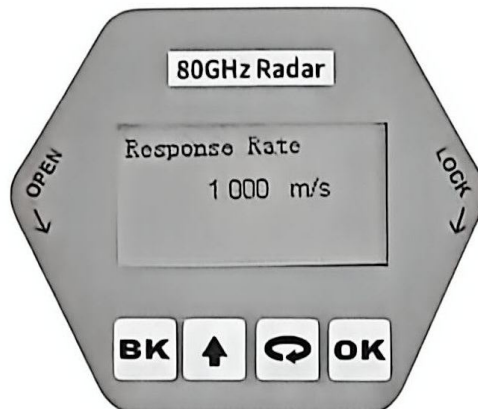


Figure 37 Response Rate Setting Interface

(8) Threshold Setting

Press the [↻] key to enter the [Threshold Setting].

【Threshold Setting】 Set the threshold size for valid echoes. The larger the threshold is set, the stronger the amplitude of the valid echoes on site is required, which is beneficial for eliminating the interference of small signal noise. Press the 【OK】 key to complete the editing operation and press the 【BK】 key to exit. The display is as follows:



Figure 38 Threshold Setting Interface

(9) Restore to factory settings

Press the [] key to enter [Restore Factory Settings].

【Restore Factory Settings】 This option is used for restoring the device to its factory settings when the basic parameter settings are disrupted.

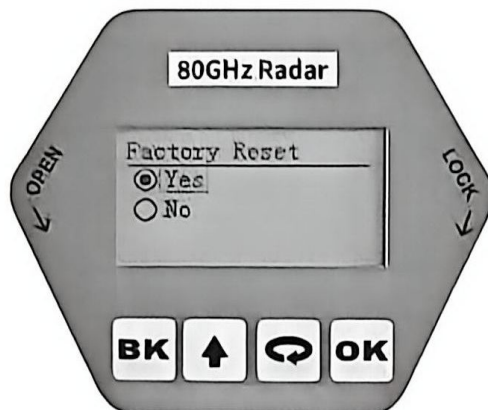


Figure 39 Factory Reset Interface

5.3.4 Display menu operations

(1) Display mode

Press the [] key to enter the [Display Mode].

The "Display Mode" setting can show three modes: material level, empty height, and proportion. Press the "OK" key to complete the editing operation and press "BK" to exit. The display is as follows:

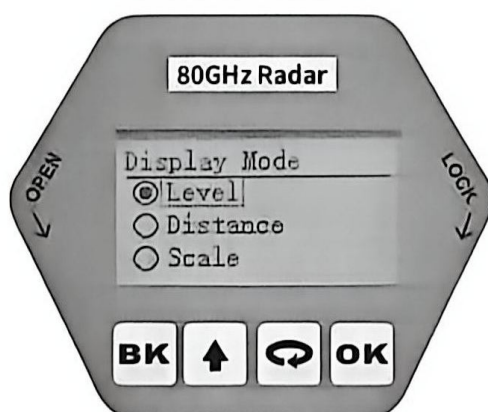


Figure 40 shows the display mode setting interface.

(2) Units of measurement

Press the [↻] key to enter [Measurement Units].

Change the default unit according to the requirement. The default unit is m. Press the 【OK】 key to complete the editing operation and press the 【BK】 key to exit. The display is as follows:



Figure 41 Measurement Unit Settings Interface

(3) Language

Press the [↻] key to enter [Language] and select Chinese, English, Korean or Russian. Press the [OK] key to complete the editing operation and press [BK] to exit. display As follows:



Figure 42 Language Settings Interface

(4) LCD contrast ratio

Press the) key to enter A (LCD)

Set [LCD] to adjust the screen brightness. Select [LCD] and press [OK] to complete the editing operation. Press [BK] to exit. The display will be as follows:

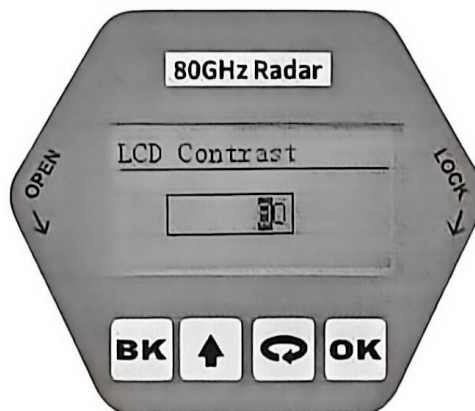


Figure 43 LCD Contrast Setting Interface

Appendix A Communication Protocol

A.1 Communication protocol hardware interface parameters

The radar level gauge communicates externally via RS485 (4-wire system) or UART (2-wire system) serial ports. The default parameters are as follows:

Communication parameters	Serial port level	Baud rate (bps)	Parity check	Data length (bit)	Stop bit (bit)
Serial port	RS485	9600	None	8	1

A.2 Communication protocol format

The level gauge adopts the Modbus RTU communication protocol for external communication. Each complete data frame includes: address code, function code, data and check. Among them, the check is the CRC16 check data of the data frame, with the low byte first and the high byte last. The default address of the level gauge radar at factory shipment is 1.

The format of the request command and the format of the radar reply data are described as follows:

(1) Query parameter format: Function code 0x03.

Request:

Device address	Function code	Start address	Number of registers	CRC
(1 byte)	(1 byte)	(2 bytes)	(2 bytes)	(2 bytes)

Reply:

Device address	Function code	Data length	Register value	CRC
(1 byte)	(1 byte)	(1 byte)	(2xN byte)	(2 byte)

N: Number of registers

(2) Query parameter format: Function code 0x04.

Request:

Device address	Function code	Start address	Register value	CRC
(1 byte)	(1 byte)	(2 byte)	(2 byte)	(2 byte)

Reply:

Device address	Function code	Data length	Register value	CRC
(1 byte)	(1 byte)	(1 byte)	(2xN byte)	(2 byte)

N: Number of registers

(2) Set parameter format: Code 0x10

Request:

Device address	Function code	Start address	Number of registers	Data length	Register value	CRC
(1 byte)	(1 byte)	(2 byte)	(2 byte N)	(1 byte)	(2N byte)	(2 byte)

Reply:

Device address	Function code	Start address	Register value	CRC
(1 byte)	(1 byte)	(2 byte)	(2 byte)	(2 byte)

A.3 Communication Protocol Format A.3 Communication Protocol Command Description

The following provides a detailed description of each command:

Set Instruction: Function code 0x10

Read command: Function code 0x03

Starting address: 0x200

Table 10 Register Addresses

Name	Register Address	Number of Registers	Function Code	Data Type	Access Type	Setting Range
Low adjustment		2	0x03/ 0x10	USIGN32	W/R	0~85000mm
High adjustment		2	0x03/ 0x10	USIGN32	W/R	0~85000mm
Range setting		2	0x03/ 0x10	USIGN32	W/R	0~85000mm
Blind zone setting		2	0x03/ 0x10	USIGN32	W/R	0~85000mm
Damping time		1	0x03/ 0x10	USIGN16	W/R	0~100s
Medium type		1	0x03/ 0x10	USIGN16	W/R	0: Liquid; 1: Solid
Medium parameters		1	0x03/ 0x10	USIGN16	W/R	0--Small container; 1-- Medium container; 2-- Large container; 3-Stirring;
Container type		1	0x03/ 0x10	USIGN16	W/R	0:Large bin; 1:Small bin; 2:Fast; 3:Test
False echo start		2	0x03/ 0x10	USIGN32	W/R	0~85000mm
False echo end		2	0x03/ 0x10	USIGN32	W/R	0~85000mm
False echo intensity		2	0x03/ 0x10	USIGN32	W/R	0-200db
Distance offset		1	0x03/ 0x10	USIGN16	W/R	-1000~1000mm
HART address		1	0x03/ 0x10	USIGN16	W/R	0-32
MODBUS address		1	0x03/ 0x10	USIGN16	W/R	1-127
MODBUS baud rate		1	0x03/ 0x10	USIGN16	W/R	0-9600 1-38400 2- 115200
Output setting		1	0x03/ 0x10	USIGN16	W/R	0:4-20mA 1:20-4mA
Current simulation		1	0x03/ 0x10	USIGN16	W/R	4000--20000
Current function		1	0x03/ 0x10	USIGN16	W/R	0: No change;; 1:22mA 2:3.6mA
Measurement mode		1	0x03/	USIGN16	W/R	0: Level; 1: Empty height

Name	Register Address	Number of Registers	Function Code	Data Type	Access Type	Access Type
			0x10			
Distance Unit	45	1	0x03/ 0x10	USIGN16	W/R	0:m; 1:cm; 1:mm
Language	46	1	0x03/ 0x10	USIGN16	W/R	0: Chinese; 1: English
LCD Contrast	47	1	0x03/ 0x10	USIGN16	W/R	40-100
Empty Height mm	0	2	0x03	USIGN32	R	Read Empty Height, Unit mm
Material Height mm	2	2	0x03	USIGN32	R	Read Liquid Level Height, Unit mm
Callback Index	61	1	0x03/ 0x10	USIGN16	W/R	1-99
Echo Radius	62	1	0x03/ 0x10	USIGN16	W/R	0-100
Window Radius	63	1	0x03/ 0x10	USIGN16	W/R	0—10000
Window Time	64	1	0x03/ 0x10	USIGN16	W/R	0-600
Callback Lock	65	1	0x03/ 0x10	USIGN16	W/R	0-Lock, 2-Unlock
First Level Filter	66	1	0x03/ 0x10	USIGN16	W/R	0-Close, 1-Open
Second Level Filter	67	1	0x03/ 0x10	USIGN16	W/R	0-Close, 1-Open
Response Rate	68	1	0x03/ 0x10	USIGN16	W/R	0—30000
Threshold Width	69	1	0x03/ 0x10	USIGN16	W/R	0-200
Threshold Strength	70	1	0x03/ 0x10	USIGN16	W/R	0-100
Factory Reset	71	1	0x03/ 0x10	USIGN16	W/R	0-Yes, 1-No

A.4 Communication example

Read low bit adjustment command is as follows:

Device address	Function code	Starting address	Number of registers	CRC
01	03	0020	0002	C5C1

The write low bit adjustment command is as follows (data value parsing order CDAB):

Device address	Function code	Start address	Number of registers	Data length	Data value	CRC
01	10	0020	0002	04	88 B8 00 00	5A32

Chapter 7 Instructions for Operating the Bluetooth App



WeChat Scan to use the mini-program.