BT7380N 76-81GHz FMCW Radar Level Gauge

Product Manual

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1. Product Introduction

1.1 Features

The BT7380N is a Frequency Modulated Continuous Wave (FMCW) radar product operating within the 76-81GHz frequency range. The product boasts a maximum measuring range of up to 30 meters with a blind zone of less than 10 cm. Due to its higher operating frequency and broader bandwidth, it achieves superior measurement accuracy. The product comes with a mounting bracket for secure installation.

The key advantages of the BT7380N model include:

- ✓ Utilizes self-developed CMOS millimeter-wave RF chips, enabling a more compact RF architecture, higher signal-to-noise ratio, and a smaller blind zone.
- ✓ 5GHz operating bandwidth, resulting in higher measurement resolution and accuracy.
- ✓ Narrowest antenna beam angle of 6°, minimizing the impact of interference in the installation environment and facilitating easier installation.
- ✓ Integrated lens design for a sleek and compact form factor.
- ✓ Separable design for display and control unit and level meter, allowing for customization.
- ✓ Low-power operation, ensuring a lifespan of over 3 years.
- ✓ Configurable upper and lower limit alarms for water level exceeding set thresholds, with the ability to upload alert information.
- ✓ Supports mobile Bluetooth debugging for convenient on-site maintenance by personnel (available in future versions).

1.2 HR738x Model Selection Guide

Based on the signal output format, the model selection for BT7380N is as follows.

Table 1-1 Model Selection Guide

Field	1	2	3	4	5	6	7
	Product Abbreviation	Communication Method	Beam Angle	Enclosure	Bracket	Lithium Battery	Display

	BT7380N	4G/485	B0	K0	Z0	D0	X0
Options		4G Output 485 Output	B0:Lens	K0:Enclosure	Z0:Bracket	D0:No Battery	X0:No Display & Control
Core Board Example	BT7380N	4G	B6	K0	Z0	D0	X0
485 Complete Unit Example	BT7380N	485	B6	K0	Z0	D0	X0

2. Technical Specifications

Table 2-1 Technical Specifications of BT7380N

Specification	Value
Transmitting Frequency	76GHz~81GHz
Measurement Range	(0.1 ~15)m, (0.1 ~30)m, (0.1 ~60)m
Measurement Resolution	±1mm
Beam Angle	6°
Power Supply Range	9-30 VDC
Communication Method	485
Operating Temperature	-40~85℃
Enclosure Material	Aluminum Alloy
Antenna Type	Lens Antenna
Recommended Cable	4*0.2mm²
Protection Level	IP68

Specification	Value
Installation Method	Bracket

3. Dimensional Structural Parameters

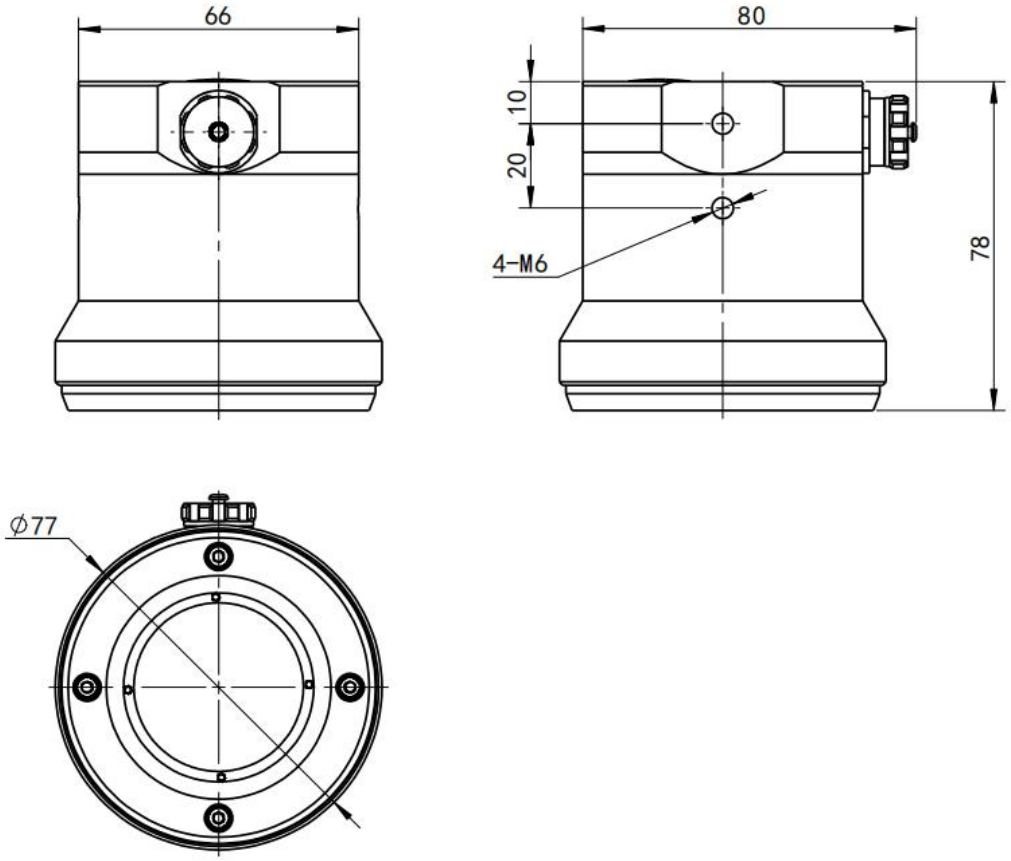


Figure 3-1 Schematic Diagram of Instrument Structure and Dimensions

4. Installation

Two main points to consider during installation:
(1) Ensure the instrument is perpendicular to the water surface, and
(2) Avoid the transmitted beam hitting any obstacles that could generate false echoes.
Refer to the following typical installation scenarios for guidance.

- ✓ Ensure the water level meter is installed perpendicular to the water surface. Tilting the meter will weaken the received signal amplitude, affecting normal ranging.

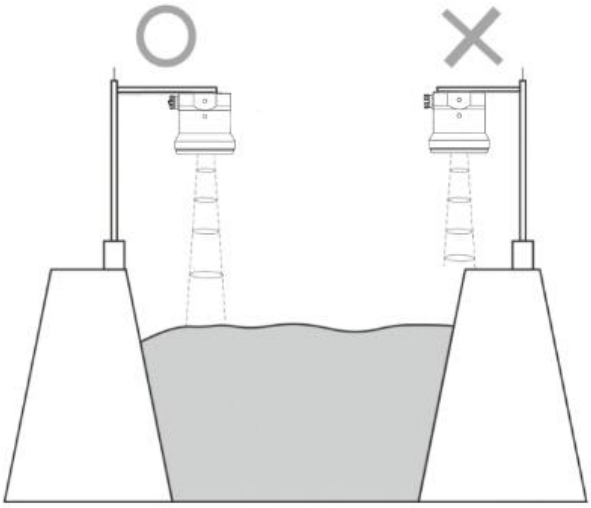


Figure 4-1: Schematic Diagram of Instrument Installation Position

✓ Ensure there are no obstacles within the beam range, such as the riverbank.

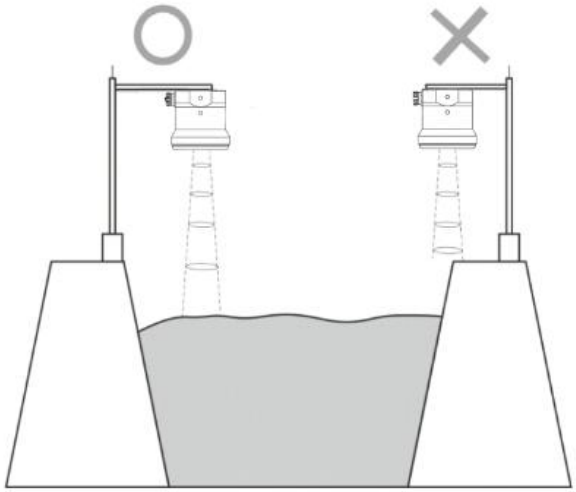


Figure 4-2: Schematic Diagram of Instrument Installation Position

✓ Install the instrument at least 20cm away from the side wall. For underground pipeline installations, position the instrument as close to the center of the manhole as possible to prevent interference signals from the well walls, which can affect measurement accuracy. As shown in Figure 4-3.

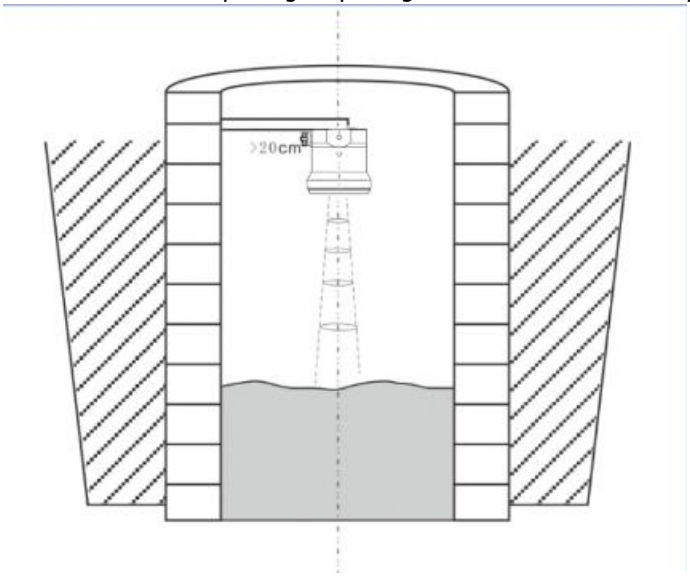


Figure 4-3: Installation with at Least 20cm Clearance from the Container Wall

5. Connection

5.1 Application Scenario 1: 4G Transmission

Figure 5-1: Product Wiring Diagram

When using an RTU for remote transmission via 4G signal, connect the level meter to the RTU through waterproof connectors A and B (waterproof rating IP68). Serial port settings: Baud rate - 9600, Data bits - 8, Stop bits - 1, Parity - None. Data is uploaded directly to the cloud platform via 4G signal.

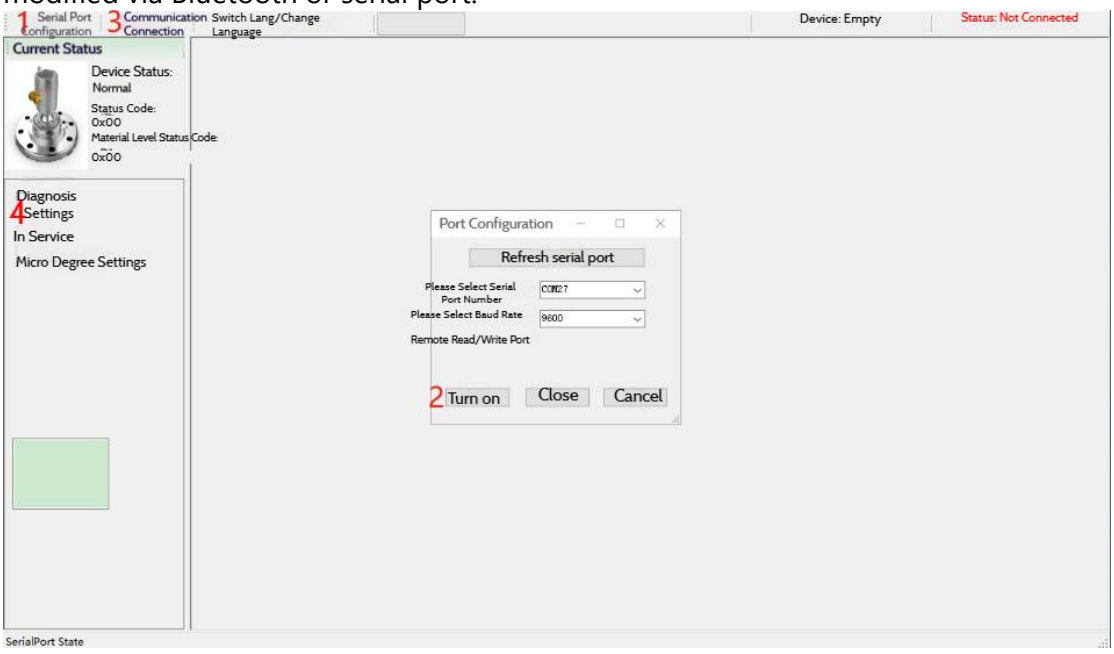
5.2 Application Scenario 2: RS485 Transmission

Figure 5-2: Product Wiring Diagram

When using RS485 transmission, the level meter extends 4 wires through waterproof connectors. Connect these wires to the user's product according to the wire sequence shown in the diagram, and then lock the connectors. The length of the B-end wires can be customized based on user requirements. Serial port settings: RS485 (correction from RS458), Baud rate - 9600, Data bits - 8, Stop bits - 1, Parity - None. Note that the device supply voltage should be within the range of 9V to 36V, and 12V is recommended.

6. Level Meter Operation

The BT7380N performs level measurement tasks based on its settings, which can be modified via Bluetooth or serial port.



6.1 PC Upper Computer Interface Description

6.1.1 Software Setup

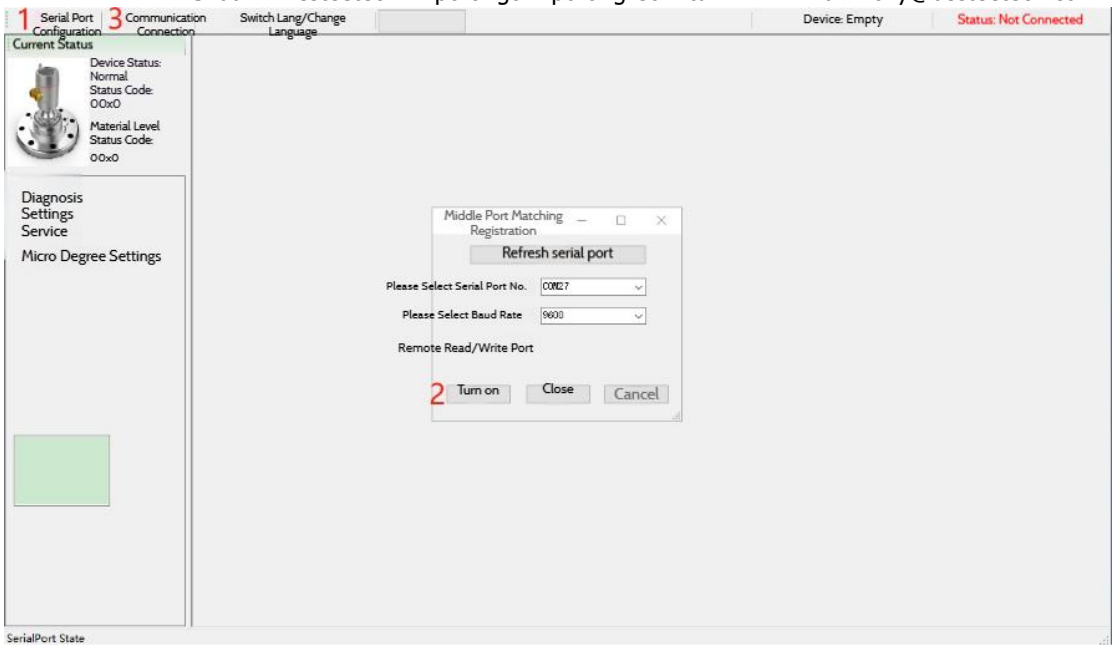


Figure 6–6 Configuring Serial Port Parameters on the Upper Computer

Follow the order in the figure to configure the serial port parameters, with a baud rate of 9600. After a successful connection, double-click "Settings" to configure and read parameters.

6.1.2 Parameter Explanation

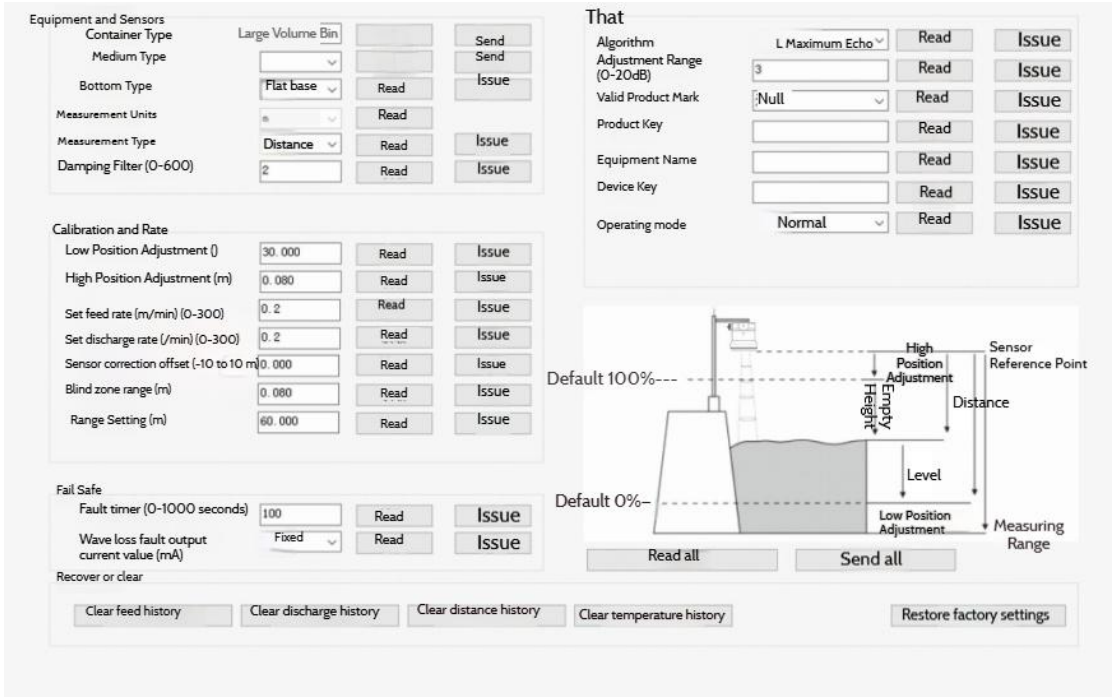


Figure 6–7 Upper Computer Settings Interface

6.1.2.1. [Measurement Type]

The [Measurement Type] allows selecting the output form of distance information based on field requirements. The core parameter is the test distance from the sensor reference point to the object being measured. Table 6-3 provides specific calculation formulas for real-time values. The high-level adjustment is defaulted to 0.

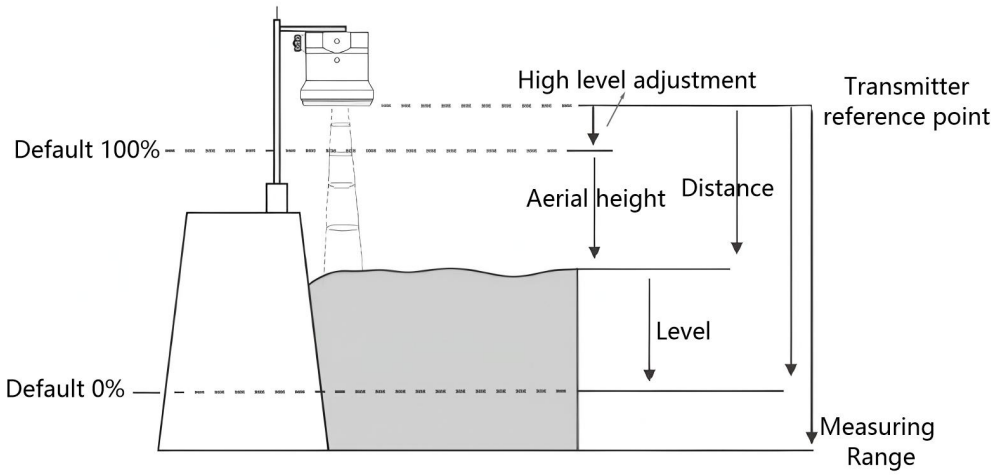


Figure 6–8 Parameter Meanings

Table 6–3 Explanation of Measurement Type Meanings

Parameter Name	Sensor Mode Measurement Type
Default Value	Distance
Associated Configuration	None
Option Meanings	Distance Mode: Real-time value = Distance Level Mode: Real-time value = Low-level Adjustment - Distance (min. 0) Height Mode: Real-time value = Distance - High-level Adjustment (min. 0)
Special Notes	If Distance > Low-level Adjustment, Level = 0; If Distance < High-level Adjustment, Empty Height = 0;

6.1.2.2. [Damping Filter]

The [Damping Time] serves to smooth out sudden changes in measurement results, acting as a damping filter. For example, with a damping time of 2 seconds, if the position of the measured object undergoes a step change at time t, the measured output value will change gradually, completing 63.2% of the change within the first 2 seconds and following the actual position by the 10th second (5 times the set value), as shown in the figure below.

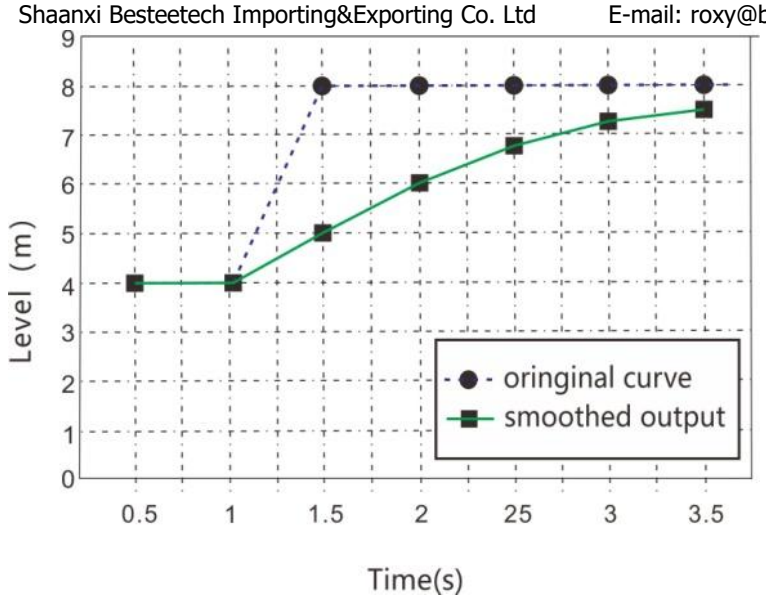


Figure 6–9 Damping Time Editing Interface and Meaning

Table 6–4 Damping Time Explanation

Parameter Name	Damping Time
Parameter Range (S)	0 ~600
Default Value (S)	0
Associated Configuration	None
Option Meanings	Damped output, enhancing signal stability
Special Notes	Temporarily not used due to short measurement time

6.1.2.3. [Low-level Adjustment]

[Low-level Adjustment] refers to the low-level adjustment point. See the figure below for specific definitions.

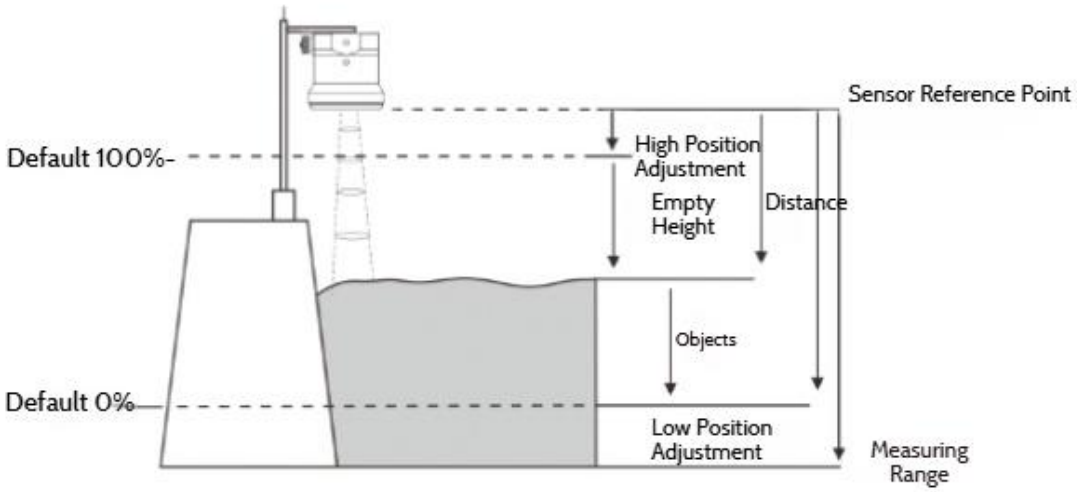


Figure 6–10 Low-level Adjustment Editing Interface and Definition

Table 6–5 Low-level Adjustment Explanation

Parameter Name	Parameter Range (m)	Default Value (m)	Associated Configuration	Special Notes
Low-level Adjustment	0.1 ~ Range	30	If set Low-level Adjustment < High-level Adjustment + 0.1, then Low-level Adjustment = (High-level Adjustment + 0.1)	Low-level adjustment point is independent of range and only affects level calculations

Parameter Name	Low-level Adjustment
Parameter Range (S)	0.1 ~ Range
Default Value (S)	30
Associated Configuration	If set Low-level Adjustment < High-level Adjustment + 0.1, then Low-level Adjustment = (High-level Adjustment + 0.1)
Option Meanings	Low-level adjustment point is independent of range and only affects level calculations

6.1.2.4. [High-level Adjustment]

[High-level Adjustment] refers to the high-level adjustment point. See Figure 6-10 for specific meanings.

Table 6–6 High-level Adjustment Explanation

Parameter Name	High-level Adjustment
Parameter Range (S)	0 ~ (Low-level Adjustment - 0.1)
Default Value (S)	0

Associated Configuration	If set High-level Adjustment > (Low-level Adjustment - 0.1), then High-level Adjustment = (Low-level Adjustment - 0.1)
Option Meanings	High-level adjustment is independent of blind zone settings and only affects empty height calculations

6.1.2.5. [Distance Offset]

[Distance Offset] is used to correct the sensor's reference point. The default reference point of the instrument is calibrated to position a as shown in the figure below during manufacturing. To adjust the reference point downwards to position b, enter h1 in the settings.

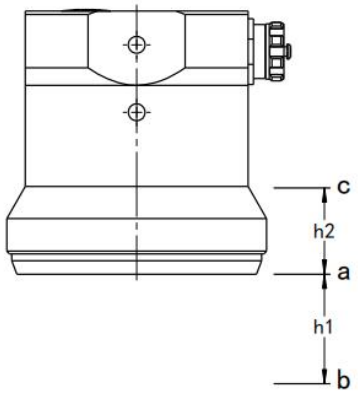


Figure 6–11 Distance Offset Editing Interface

Table 6–8 Distance Offset Explanation

Parameter Name	Distance Offset
Parameter Range (S)	(-Built-in Offset) ~ 10m
Default Value (S)	()
Associated Configuration	None
Option Meanings	Corrects the zero point of the sensor's reference point. The range of sensor output values remains between [Blind Zone] and [Range], and the actual sensor measurement range is normalized to the initial reference point as: [Distance Offset + Blind Zone] ~ [Distance Offset + Range]
Special Notes	

6.1.2.6. [Blind Zone Setting]

See the table below for specific meanings.

Table 6–9 Blind Zone Explanation

Parameter Name	Blind Zone
Parameter Range (S)	0 ~ (Range - 0.1)
Default Value (S)	0
Associated Configuration	If set Blind Zone > (Range - 0.1), then Blind Zone = (Range - 0.1)
Option Meanings	Ignores echoes within the blind zone during algorithm processing, allowing for avoidance of near-end interference signals
Special Notes	This blind zone does not refer to the instrument's near-end measurement limit but is used to define the algorithm area. Refer to the technical specifications section for the instrument's

6.1.2.7. [Range Setting]

To obtain accurate measurement results, it is necessary to set the instrument's range.
See the table below for specific meanings.

Table 6–10 Range Explanation

Parameter Name	Range
Parameter Range (S)	1~30
Default Value (S)	10
Associated Configuration	If set Range < (Blind Zone + 0.1m), then Range is automatically set to (Blind Zone + 0.1m)
Option Meanings	Ignores echoes outside the range during algorithm processing. Reasonable range settings can avoid multiple reflection interference and possible interference signals outside the range.
Special Notes	This range does not refer to the instrument's far-end measurement limit but is used to define the algorithm area. Refer to the technical specifications section for the instrument's measurement limits.

Note: The blind zone and range determine the specific range of algorithm application. By configuring them reasonably, interference and false echoes can be avoided, enabling fast and stable measurements.

6.1.2.8. [Threshold Margin]

The margin above the background condition echo curve. Used to adjust the threshold curve and filter out interference signals.

6.1.2.9. [NB Product Valid Flag]

Used to indicate whether device key parameters have been configured. Only when valid can NB be used. After device restart, if the flag is judged as invalid and no serial port configuration parameters are received within 10 seconds, the device enters sleep mode until the next wakeup (via button press or power cycling).

6.1.2.10. [Product Key]

Using NB requires configuring a product key that matches the one on Alibaba Cloud. You can obtain the product key by logging into Alibaba Cloud or from an app (to be developed).

6.1.2.11. [Device Name]

Using NB requires configuring a device name that matches the one added on Alibaba Cloud. You can obtain the device name by logging into Alibaba Cloud or from an app (to be developed).

6.1.2.12. [Device Key]

Using NB requires configuring a device key that matches the one added on Alibaba Cloud. You can obtain the device key by logging into Alibaba Cloud or from an app (to be developed).

7. Problem Diagnosis

Phenomenon	Possible Reasons	Solutions