

DR6421 RADAR LEVEL TRANSMITTER

User Manual



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1. Product Introduction

1.1 Product Overview

The DR6421 Radar Level Transmitter is a 76-81GHz Frequency Modulated Continuous Wave (FMCW) radar product (commonly referred to as a millimeter-wave radar). By utilizing a millimeter-wave band with a much higher frequency than traditional Ku-band radars, this device achieves a significantly more compact RF architecture, a higher signal-to-noise ratio, a smaller near-range blind zone, and an exceptionally narrow beam angle. The product exhibits remarkable anti-interference capabilities and superior material penetration. Featuring a highly compact mechanical profile, it supports both thread and bracket mounting modes (customized mounting designs can also be tailored to specific site environments).

Primary Advantages:

- **High Resolution:** Features a maximum operating bandwidth of 5GHz, enabling the product to deliver enhanced measurement resolution and pinpoint precision.
- **Strong Anti-Interference:** The ultra-narrow beam angle (as low as $\pm 3^\circ$) delivers powerful anti-interference performance and drastically simplifies installation clearance demands.
- **High Detection Precision:** The 80GHz high-frequency radar wave has an incredibly short wavelength ($\approx 3\text{mm}$), ensuring supreme detection sensitivity.
- **Effortless Maintenance:** Supports multiple output and configuration interfaces (RS485, 4-20mA, Mobile APP) for frictionless deployment, commissioning, and diagnostic maintenance.

1.2 Scope of Application

1.2.1 Measured Media

Generally, the dielectric constant of the target measured liquid medium must be **greater than 4** to ensure an optimal radar reflection cross-section.

1.2.2 Ambient Temperature

The operating ambient temperature range for the radar level transmitter is **-20°C ~ +70°C**. In cold northern regions, we recommend placing the device inside a dedicated instrument protective box. In areas exposed to intense direct sunlight, we strongly advise installing the instrument in a shaded area or adding a sunshield. This prevents internal overheating caused by solar radiation while ensuring excellent natural

ventilation and heat dissipation.

1.2.3 Ingress Protection Rating

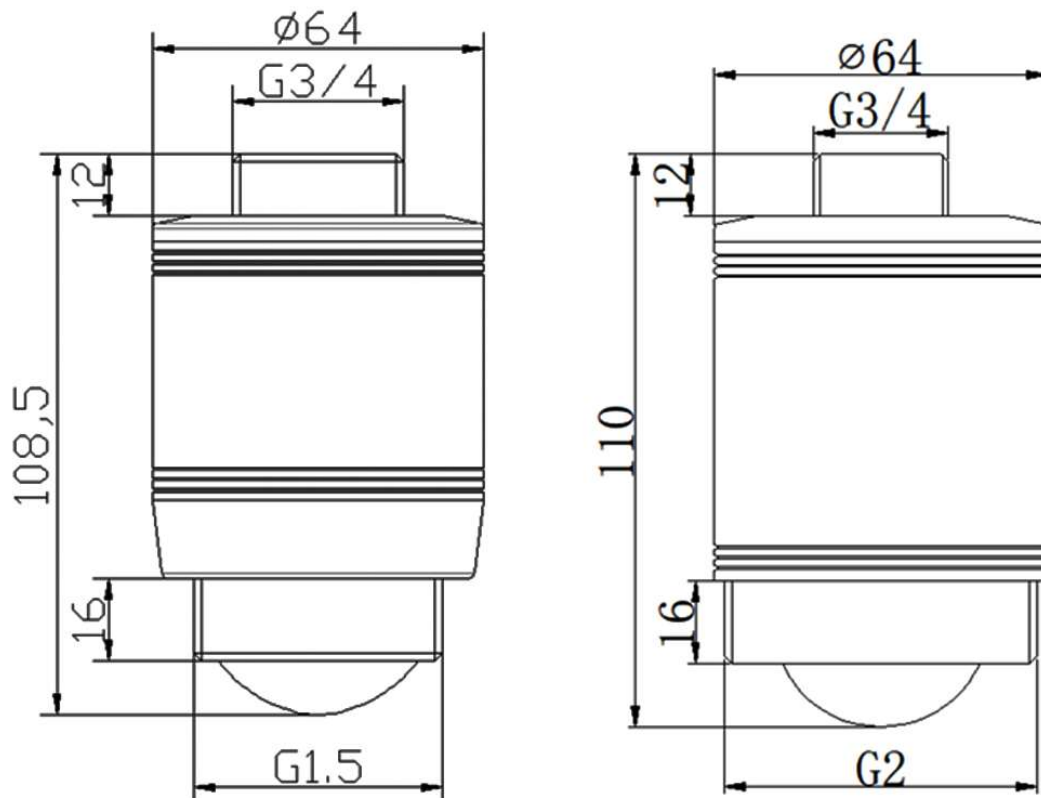
The waterproof and dustproof enclosure rating is **IP67**.

1.3 Technical Specifications

Parameter	Specification Details
Radar Type	2-Wire System / Digital Radar Level Meter
Measurement Range	5m, 10m, 15m, 20m
Measurement Error	±2mm
Beam Angle	±3°
Offset Migration	±9.9m
Signal Output Options	4 ~ 20mA, RS485, 4G, NB-IoT, LoRa
Power Supply	DC 24V (22V~30V)
Operating Temperature	-20°C ~ +70°C
Operating Humidity	(0% ~ 95%) RH
Protection Rating	IP67
Configuration Interface	Mobile App via Bluetooth / PC Software via RS485
Housing Material	High-performance Engineering Plastic, Aluminum Alloy,

Parameter	Specification Details
	Stainless Steel
Antenna Material	PP (Polypropylene)
Main Unit Weight	0.5 KG
Process Connection	G1.5 Thread, G2 Thread, or Mounting Bracket

1.4 Dimensional Structure Drawings



(Refer to the structural outline blueprints below for detailed unit boundaries)

- **Model DR6421 (G1.5 Thread Interface):** Total height 108.5mm, main body diameter 64mm, upper cable gland thread G3/4 (height 12mm), lower thread connection G1.5 (height 16mm).
- **Model DR6421 (G2 Thread Interface):** Total height 110mm, main body

diameter 64mm, upper cable gland thread G3/4 (height 12mm), lower thread connection G2 (height 16mm).

2. Product Installation Instructions

2.1 Pre-Installation Inspection

1. Remove the instrument from the packaging box carefully. Check all included device accessories against the user manual packing list to ensure everything is present.
2. Thoroughly read through this product user manual and verify the product conformity certificate.
3. Inspect the instrument exterior for any physical damage—pay special attention to the radar lens antenna seal to ensure it is completely intact. Store the instrument safely before mounting.

2.2 Radar Installation

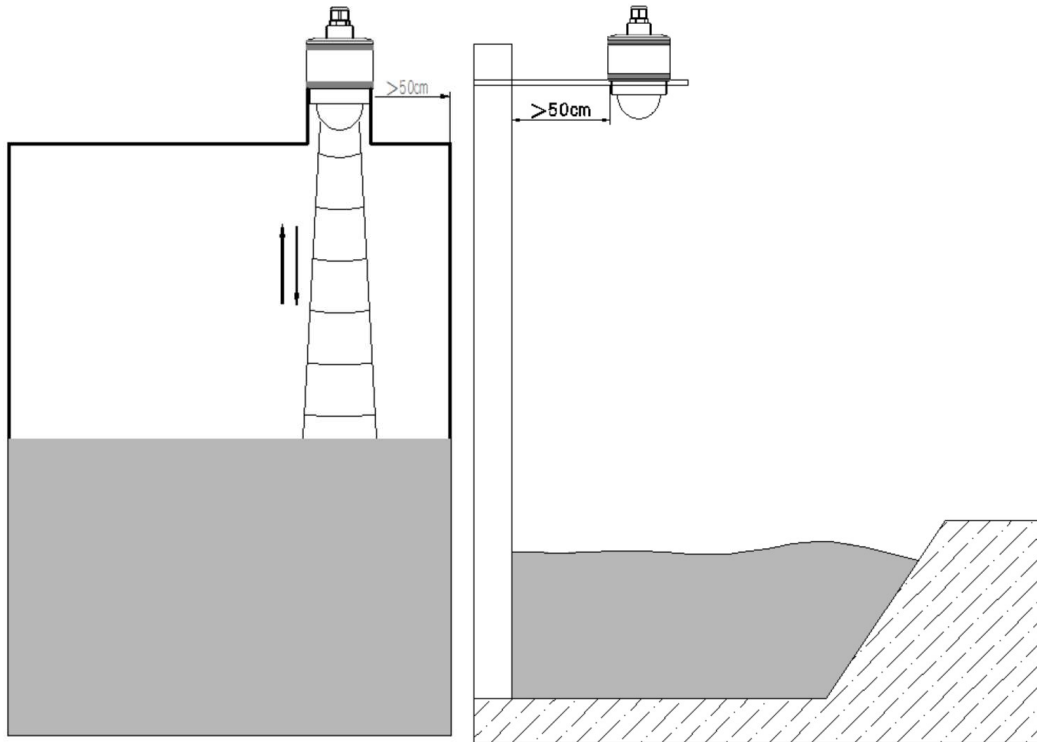
Preparation Work:

Analyze the inner layout and pipe distribution of the storage tank. Confirm critical parameters such as the tank diameter and maximum required measurement range.

- **Required Field Tools:** Flathead screwdriver (3 x75 mm), wire strippers (7mm), utility knife, pipe wrench, and a stable DC 24V power source.

Crucial Installation Rules:

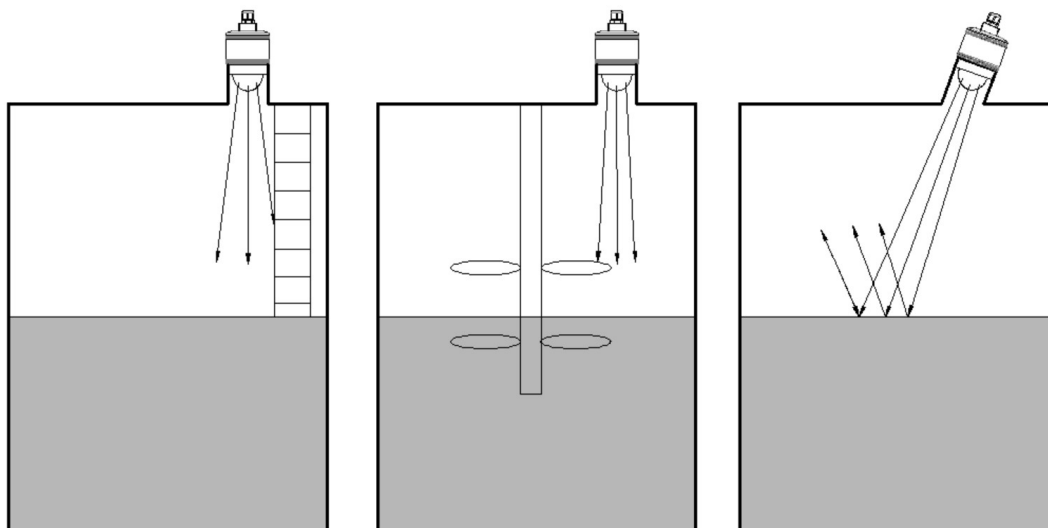
1. **Vertical Alignment:** Always install the instrument perfectly **perpendicular (vertical)** relative to the target liquid surface.
2. **Avoid Obstacles:** Ensure the radar wave emission beam does not hit internal obstacles (such as ladders, heating coils, or agitators). Obstacles create false echo reflections that ruin measurement accuracy.



Storage tank installation diagram

River channel installation diagram

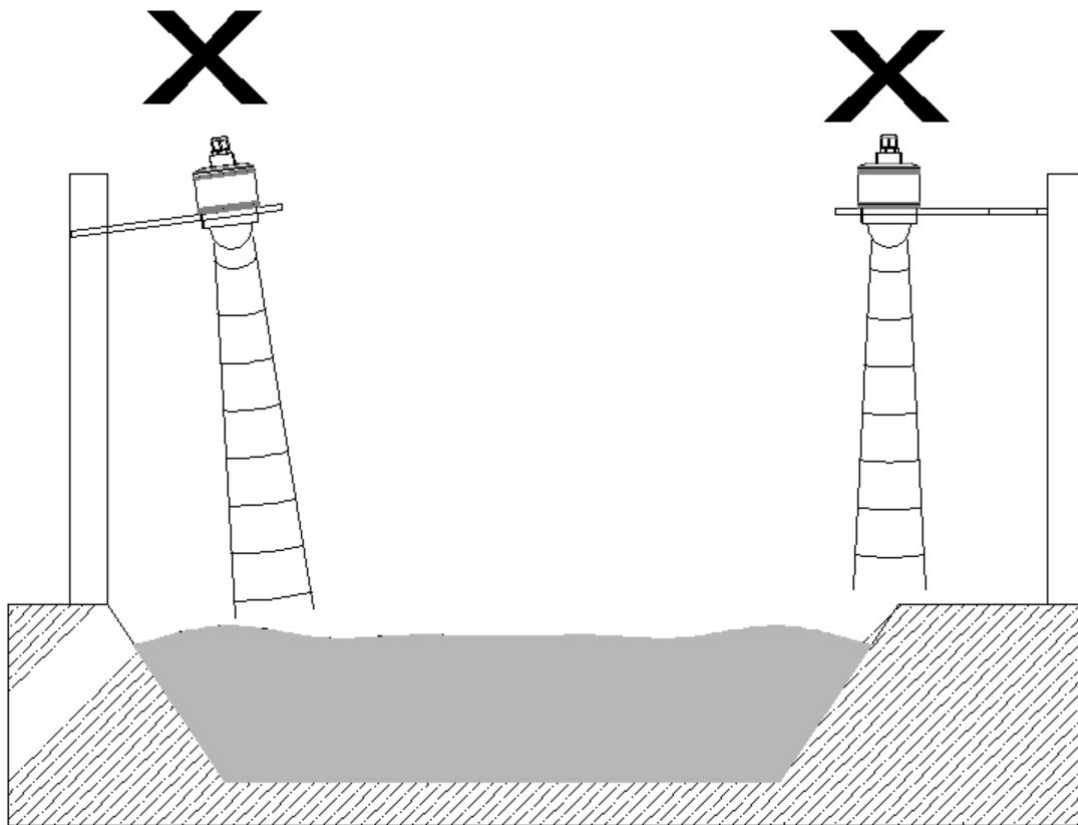
(When installing over open rivers, ensure the mounting bracket holds the radar extended horizontally at least 50cm out from the river bank edge to allow an unobstructed beam path to the water).



Incorrect A

Incorrect B

Incorrect C



Incorrect D

Incorrect A: Radar beam hitting the internal tank ladder.

Incorrect B: Radar beam hitting the internal tank agitator.

Incorrect C: Tilted radar installation.

Incorrect D: Incorrect radar installation method for river channel.

2.3 Crucial Precautions

1. Secure the instrument firmly upon completing installation to eliminate any shaking or vibrations.
2. Maintain a minimum distance of **at least 30cm** between the sensor antenna and the maximum possible high liquid level line.
3. Ensure the installation point sits **more than 50cm away** from the tank wall, water pool edge, or river channel embankment.
4. Choose an installation point where the liquid surface remains calm. Do not install the transmitter directly above liquid inlets or outlets where violent turbulence occurs.

3. Radar Calibration & Configuration

3.1 Device Wiring

Connect the 4-core cable using the pinout matrix below:

- **Red Wire:** DC 24V Power Supply Positive
- **Blue Wire:** DC 24V Power Supply Negative
- **Yellow Wire:** RS485 Communication Line A (RS485A)
- **Green Wire:** RS485 Communication Line B (RS485B)

3.2 Mobile APP Operation Guide



- Enable Bluetooth on your smartphone and launch the "**Radar Life**" mobile application. The app automatically displays the connection interface. Tap on our specific device name (e.g., **RD-01**) to establish a secure link.
- Tap the "**Measurement**" tab to open the device status console. This window shows the active connection stability, real-time material level readings (m), distance values (m), current loop output (mA), and level percentage (%).
- Tap the "**Echo Curve**" tab to open the real-time wave analyzer. This screen charts the target echo signal reflection waveform, distance (m), and echo return quality score.
- Tap the "**Settings**" tab to access the core parameter matrices. Here, you can adjust advanced internal parameters (Note: Only authorized engineering specialists should modify these configuration trees).

Device Connection

RD-01	RD-01	-31
RD-02	RD-02	
RD-03	RD-03	
RD-04	RD-04	
RD-05	RD-05	
RD-06	RD-06	
RD-07	RD-07	
RD-08	RD-08	

Equipment

Measure

Station Number: RD-01

Material Level(m): 38.574

Distance Value(m): 1.426

Current(mA): 19.429

Percentage(%): 96.43

Running State: 0

Measure

Echo Profile

Station Number: RD-01

Distance Value(m): 1.425

Echo Quality: 48

BACK

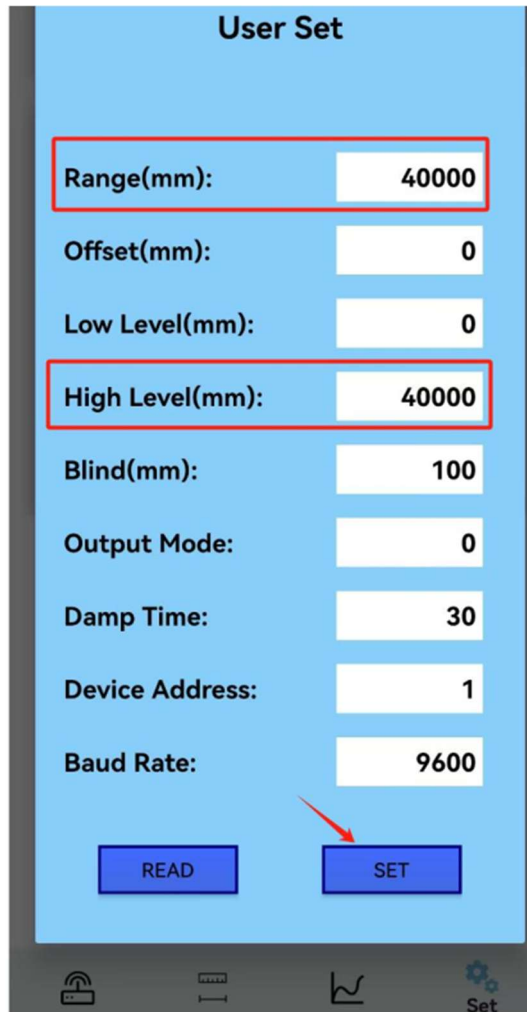
Curve

Parameter

Station Number: RD-01

- User Set >>
- System Set >>
- Measurement Set >>
- False echo set >>
- Restore Factory Set >>

Set



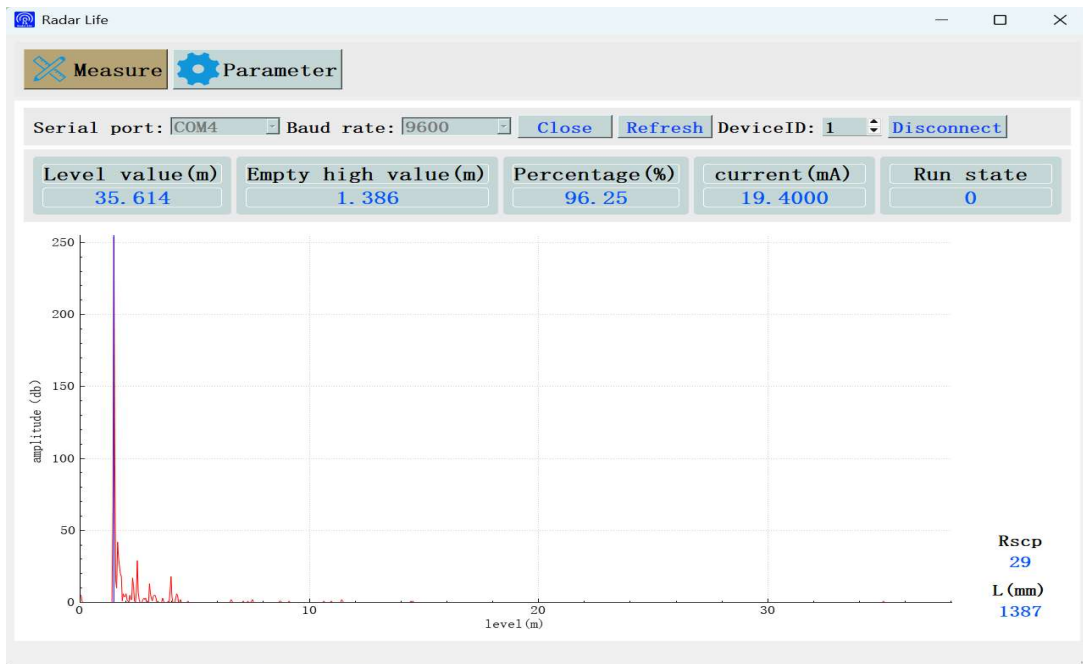
3.3 PC Upper Computer Software Tuning



- Connect the radar device to your computer via an RS485-to-USB serial adapter tool. Launch the native computer application "**Radar Life.exe**".
- Navigate to the "**Measure**" dashboard panel. Select your correct PC COM port and set the baud rate to 9600. Click "**Open**" and then "**Connect**" to establish the data link. Once connected, the app charts the live digital level data and reflection amplitude curve.
- Click the "**Parameter**" tab to view user configuration limits. Here you can input values for Range (mm), 20mA Position (mm), Blind Area (mm), and Damping Time (s).

- Operational Tip:* We recommend setting the "**Range**" value and the "**20mA**

"Position" value to the exact same figure for optimized mapping.



The screenshot shows the 'Radar Life' software interface with the 'Parameter' tab selected. The 'User Parameters' section is expanded, showing the following configuration:

Range (mm):	37000	Offset (mm):	0	4mA Position (mm):	0
20mA Position (mm):	37000	Blind Area (mm):	200	Output Mode:	level
Damping Time:	30	Device Address:	1	Baud Rate (bps):	9600

Below the table are 'Set' and 'Read' buttons. Below the 'User Parameters' section are four collapsed sections: 'System Parameter', 'Measurement Parameters', 'False Echo', and 'Restore factory settings', each with a '+' button to expand it.

4. Product Selection & Model Configuration

Selection Field	Model Code	Functional Feature Specifications	Description Notes
Series Code	DR6421		80GHz High-Frequency Radar Level Gauge Series
Measured Media	Y	Liquid	Intended for liquid media level measurement
Measurement Range		5 / 10 / 15 / 20	Defines max range boundary: 5m, 10m, 15m, or 20m
Display Option		0 1	No local display (Blind / App configuration) Integrated 128x64 LCD Display
Signal Output		A B	RS485 Modbus + Mobile App Bluetooth Interface 2-Wire 4–20mA + RS485 + Mobile App Bluetooth
Process Connection		G	Standard G1.5 Industrial Screw Thread
Outer		P	High-performance Engineering Plastic

Selection Field	Model Code	Functional Feature Specifications	Description Notes
Enclosure		S A	Housing Industrial Stainless Steel Shell Enclosure Die-Cast Aluminum Alloy Enclosure Shield
Protection Rating		7	Fully sealed IP67 Weatherproof Rating

5. Maintenance and Repair

- Keep the radar level transmitter casing clean. Ensure the installation remains protected against continuous moisture ingress, direct water pooling, chemical corrosion, and mechanical impacts or drops.
- Avoid exposing the main radar transmitter body to intense direct sunlight. Keep the instrument away from heavy external heat sources and ensure adequate ventilation. If ambient temperatures exceed rated thresholds, install appropriate thermal isolation shields or cooling protections.
- In freezing climates, install a dedicated instrument protective box or thermal heating jackets to prevent icing. Always keep the internal transmitter terminal compartments dry.
- Perform periodic inspection checks on the radar sensor. (The operating enterprise should determine the exact maintenance cycle based on the severity of the local site conditions).

6. Troubleshooting

Symptom	Probable Cause	Actionable Solution
No display / Cannot connect via App	Power supply failure	Measure the DC 24V supply line. Verify that voltage and current values match the power requirements.
	Wiring fault	Trace the 4-wire color map. Verify that positive, negative, and communication lines are wired correctly.
Unstable level readings / Fluctuating data	Heavy surface turbulence	Relocate the transmitter to a calmer section of the tank, or increase the damping time filter constant.
	Weak echo signal reflection	Perform an accurate vertical angle calibration or rotate the radar orientation to improve the reflection face.
	High electromagnetic interference (EMI)	Connect the main device housing securely to a true earth ground, or use high-grade shielded cables.

7. Modbus RTU Communication Protocol

1. General Serial Settings:

The radar level transmitter functions as a standard Modbus RTU slave device. It uses Modbus RTU protocol, 8 data bits, 1 stop bit, and no parity checking. The default baud rate is 9600 bps. The default Slave Device Address is 0x01.

2. Read Measurement Values (Function Code: 0x03, Command Code: 0x04)

Register Mapping:

- **3001H / 1001H:** Material Level Value (32-bit Unsigned Integer, Unit: mm)

- **3003H / 1003H:** Empty Distance Value (32-bit Unsigned Integer, Unit: mm)

3. Write System Parameters (Function Code: 0x10)

Register Mapping:

- **3001H / 3002H:** Full Scale Measurement Range (32-bit Unsigned Integer, Unit: mm)
- **3003H / 3004H:** Offset Migration Shift value (32-bit Unsigned Integer, Unit: mm)
- **3005H / 3006H:** Low Material Level Threshold (32-bit Unsigned Integer, Unit: mm)
- **3007H / 3008H:** High Material Level Threshold (32-bit Unsigned Integer, Unit: mm)
- **3050H / 3051H:** Near-range Instrument Blind Area (32-bit Unsigned Integer, Unit: mm)
- **3052H / 3053H:** Serial Baud Rate Setting (16-bit Unsigned Integer, Unit: bps)
- **3053H / 3052H:** Device Slave Address Configuration (16-bit Unsigned Integer, Value Range: 1-255)

4. Read System Parameters (Function Code: 0x03)

Register Mapping:

- **3001H / 3000H:** Full Scale Measurement Range (32-bit Unsigned Integer, Unit: mm)
- **3003H / 3002H:** Offset Migration Shift value (32-bit Unsigned Integer, Unit: mm)
- **3005H / 3004H:** Low Material Level Threshold (32-bit Unsigned Integer, Unit: mm)
- **3007H / 3006H:** High Material Level Threshold (32-bit Unsigned Integer, Unit: mm)
- **3050H / 3051H:** Near-range Instrument Blind Area (32-bit Unsigned Integer, Unit: mm)
- **3052H / 3051H:** Serial Baud Rate Setting (16-bit Unsigned Integer, Unit: bps)
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