

Portable Level Transmitter

Manual Book (Ver:1.01)

**SHAANXI SHENGKE ELECTRONIC
TECHNOLOGY CO.,Ltd**

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1. Warranty and service scope

The portable level transmitter comes with a one-year warranty starting from the shipment date, and repair and maintenance are guaranteed for six months. This warranty is limited to the original purchaser or the user of the designated dealer and does not apply to any damage caused by human factors, including misuse, alteration, negligence, accident, or use under abnormal conditions.

Free repairs are provided for any faulty portable level transmitter returned within the warranty. To claim service under warranty, please contact our after-sales service department and attach a description of the defect. Following authorization by company representatives, please post your portable level transmitter to our after-sales service department.

If the warranty of your portable level transmitter has expired or the malfunction was caused by misuse, modification, negligence, accident, or use under abnormal conditions, a quote will be provided according to the relevant maintenance fee standard, and maintenance will be carried out following customer approval. After the radar level transmitter is repaired, it will be mailed back to the customer, who will be required to pay for the repair and transportation costs. (Attached: Warranty Form)

2. Unpacking inspection and precautions

2.1 Unpacking inspection

- User's manual
- Certificate
- Portable Level Transmitter
- Packing list
- Check the enclosed items against the packing list

2.2 Precautions

- Please read this manual in its entirety before installation.
- Modifications due to product upgrades will not be indicated, please refer to the actual product.

3. Storage and Transportation

- $-40 \sim +60$ °C Storage Temperature: - 40 ~+60 Temperature

4. Product description

4.1 Product Overview

This portable level transmitter is developed to measure the level inside from the outside wall (bottom) of the vessel/tank by using the sonar ranging principle.

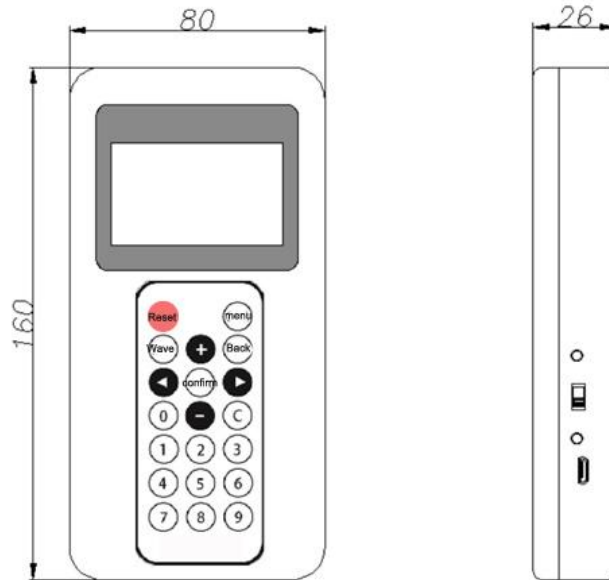
It realizes the real non-invasive level measurement in sealed container. Simply bonded the sonar sensor (probe) directly at the bottom of the vessel/tank. An ultrasonic sound wave travels through the tank and reflects back from the media surface. The system calculates the height of the liquid, from the time taken for the signal to be received.

4.2 Technical Parameters

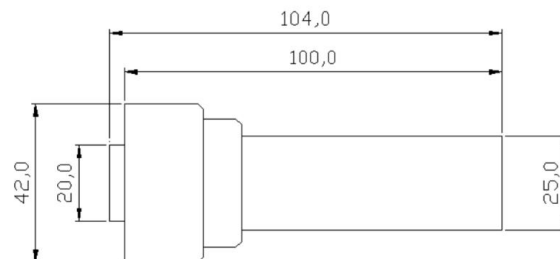
Max Measuring Range	6m
Display Resolution	1mm
Measurement error	≤10mm
Display	128×64LCD
Dead Zone	3cm for ideal working condition; the specific value depends on the complexity of the working condition
Measurement temp range	-45°C~+80°C
Power	< 0.5W
Power supply	3.7 V lithium battery
Charging time	< 3 hours
Continuous working hours	12 hours
Ambient temperature	-20°C~+70°C
Ambient humidity	(0%~95%)RH
Weight	370g
Dimension	Lenth160mm×Width80mm×Height26mm

5. Level transmitter dimension

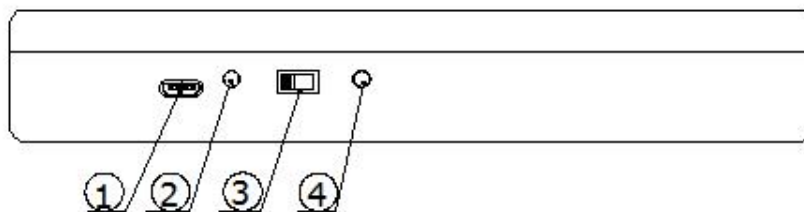
5.1 Mainframe dimension



5.2 Sensor probe dimension



5.3 Electrical part

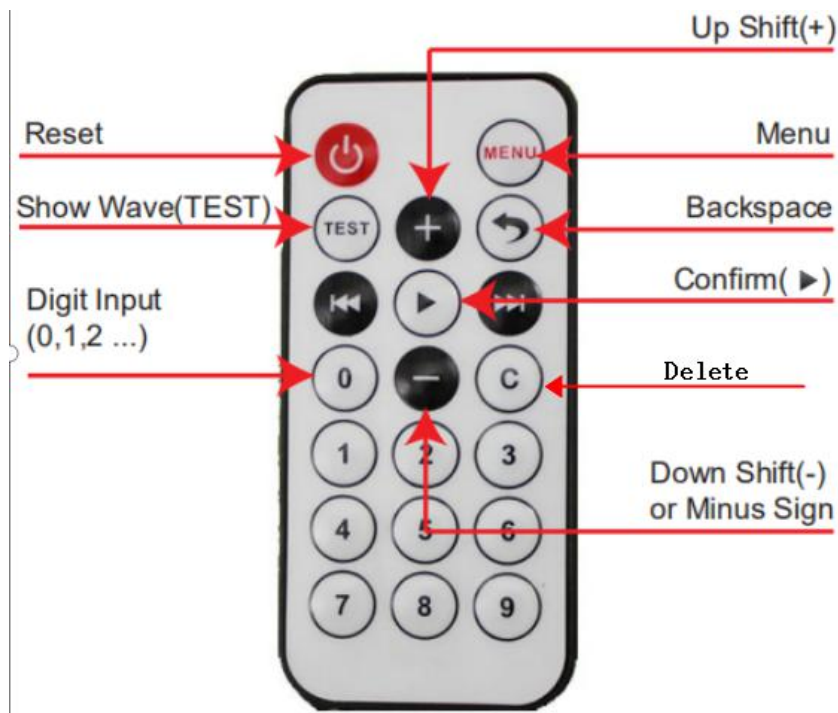


1. **Micro USB**; for charging. Compatible with the common mobile phone adapter.
2. **Charging indicator**; red light shows charging is in progress; green light shows charging is completed.
3. **Power switch**;
4. Indicator light in working

6. Parameter Description

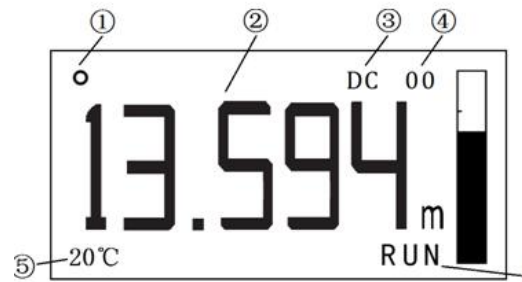
6.1 Parameter setting

The instrument uses buttons to set parameters, and the functions of the keys are shown in the following figure:



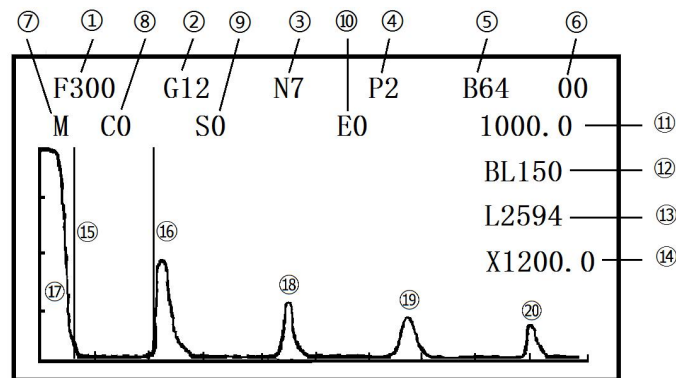
1. **Reset/restart:** reset or restart the instrument;
2. **Menu:** Open the menu, check and change the working parameters.
3. **Test:** Display real-time echo wave and parameters of the instrument and assist in debugging and diagnosis.
4. **Backspace:** Under the menu or waveform interface, return to the main working interface.
5. All of the other button are used to edit the con-figs

6.2 LCD main interface description



①	Work Indicator	Blinking tips at work
②	Level Display	(m)Level Value (%)Percentage
③	Working Mode	SM:Single probe measure DC:diameter calibration TC:temperature calibration DT:double ways calibration
④	FaultCode	00:No fault 01:Current Output Fault 02:Receiving waveform abnormality 08:Level entering dead zone 10:No echo signals 20:Abnormal transmitting waveform 80:Excessive noise interference
⑤	Temperature	When the temperature calibration function is turned on, the measured temperature value is displayed. When the temperature probe fails, Err°C is displayed.
⑥	Working Probe	RUN:measuring probe is working CAL:calibration probe is working

6.3 LCD waveform Interface description



①	F(100~2000) work frequency
②	G(0~96)work gain
③	N(1~10)Number of emission pulses
④	P(1/2) power grade
⑤	B(1~1000)Envelope width
⑥	(00~FF) fault co
⑦	(M/C)measure probe/calibration probe waveform switching display
⑧	C(0/1)Manual Calibrate the Sound Speed
⑨	Sxxxxx(unit:mm)Initial position of waveform display
⑩	Exxxxx(unit:mm)Termination position of waveform display
⑪	(unit:m/s)sound speed value
⑫	BLxxx(Unit:mm)Blindarea value
⑬	Lxxxx(unit:mm)level value
⑭	(unit:mm)Waveform area X-axis scale value
⑮	blind area zone position
⑯	echo position(Primary echo)
⑰	Transmitting wave
⑱	Second echo
⑲	Third echo
⑳	Fourth echo

6.4 Parameters menu

6.4.1 User parameter menu description

User parameters	Basic setting	Max measure range	
		Sound speed	
		Transfer volume	
	Measure mode	Single probe	
		Temperature calibration	
	Temperature calibration set	Medium	
		Temperature migration	
		Filtering time	
	Debug mode	Automatic measurement mode	
		Manual measurement mode	
	Working Parameters	Measurement Parameters	Frequency、 Gain Type Gain、 Power Pulse Number、Envelope Width

6.4.2 User Parameter setup scope and definition

• Basic Setting

Max Measure Range (50~50000)mm: Depending on the working condition, it indicates the highest liquid level that can be measured by the level transmitter, and also determines the magnitude of 4-20 mA current output.

Sound Speed(400~1800)m/s: Depending on the medium to be measured, it represents the sound velocity value used by the level transmitter in the mode of single probe operation.

Transfer Volume(-9999~9999)mm: According to the specific working conditions, it indicates the displacement of the installation position of the liquid level transmitter measuring probe relative to the zero liquid position in the field.

• Measure Mode

Single Probe Mode: The level transmitter operates with a fixed sound speed.

Temperature Calibration Mode: The liquid level meter works at sound speed after temperature compensation.

• Temperature Calibration Setting

Medium: Select the type of medium to be measured; when temperature calibration is enabled, the sound velocity is calibrated according to the type of medium.

Temperature Migration(-100~100)°C: When the temperature measured by liquid level transmitter deviates from the actual temperature, the temperature error is corrected by "temperature offset".

Filtering Time(1-600)min: Adjust the parameters that show how fast the temperature changes.

• Debug Mode

Automatic Measurement Mode: The instrument automatically searches for the echo signal of the probe, calculates and stores the "best working parameters" and then works with these parameters.

Manual Measurement Mode: Manually adjust the working parameters of the probe to get the best echo signal.

- **Working Parameters**

Measurement Parameters: Indicate the working parameters of the probe.

Frequency(100~2000)kHz: Represents the transmission frequency of sonar waves.

Gain Type(Automatic gain, fixed gain): Automatic gain means that the host automatically adjusts the internal parameters according to the strength of the echo signal, so that the echo signal level is within the expected value. Fixed gain is only used for internal testing.

Gain(0~96): Represents the strength of the echo signal. The larger the gain, the smaller the echo signal.

Power(low grade P1,high grade P2): It is used to set transmitting power, select "low-grade" for EASY-TO-TEST conditions and "high-grade" for complex and difficult-to-test conditions.

Envelope Width(1~1000): The default value of 64 is usually used for the size of the window enveloped by the waveform. The smaller the envelope width is, the more accurate the waveform is and the smoother the waveform is.

Calibration Parameter: Represents the working parameters of the calibration probe. Calibration parameter items and measurement parameters are the same, and Parameter definitions are the same, but the probes used are different

7. Installation and debugging

7.1 Preparation prior to installation

Before debugging, it is necessary to ensure that the liquid level in the tank is higher than 1 m and the liquid level meets the calibration conditions of diameter.

Understand the internal structure and pipeline arrangement of the tank, and obtain the information of tank diameter, measurement range, wall thickness, etc.

7.2 Installation location

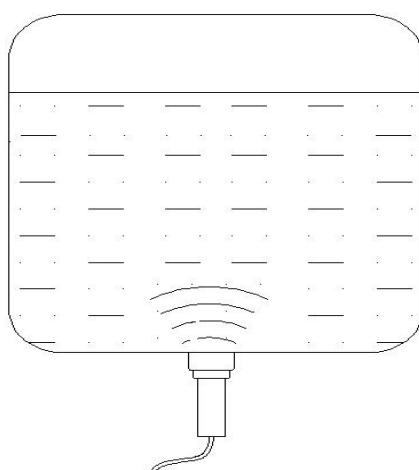
According to the equipment diagram of storage tank, the optimum installation point of probe is selected.

• Basic Principles of Probe Installation

The probe pointing is completely perpendicular to the liquid level, and the calibration probe pointing is parallel to the liquid level.

The probe is installed as far away as possible from the inlet and outlet and the weld.

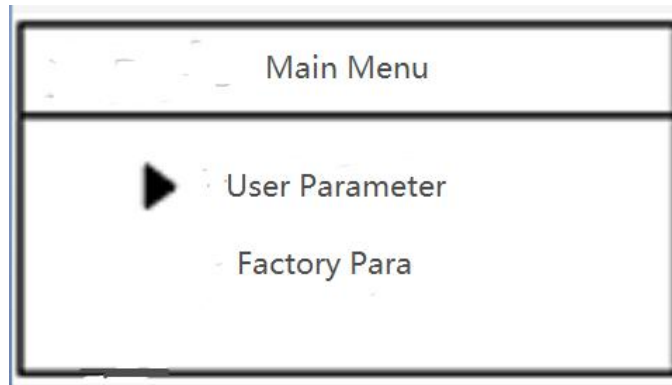
The probe points to the front without any obstruction such as pipeline.



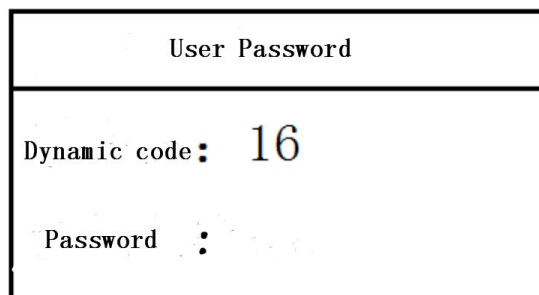
7.3 Debugging steps

7.3.1 Debugging

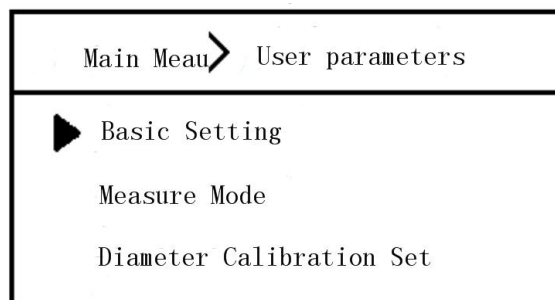
- Instrument Parameter Setting
- At the main display window, press the "menu" key, as shown in the following figure:



Press the "**confirmation**" key to enter the "**user parameters**", then the "**dynamic code: XX**" will be displayed, prompting you to enter the password.



The password value is "**XX**" **multiplied by 2 and subtracted by 1**. For example, dynamic code: 16, then the password value is equal to $16 * 2 - 1$; input 31, press the "confirmation" key to enter the "**user parameters**".



Basic Settings

- Set the "**Measure range**" based on your tank condition.

Press the "confirmation", when the range value is reversed, use the digital key to input the range value, and then press the "confirmation" key to confirm.

- Set the "**sound speed**".

Select the "**sound speed**" downward, press the "confirmation" button to input the sound velocity value of the medium (if uncertain, random set it as 1000), and press the "confirmation" button to confirm.

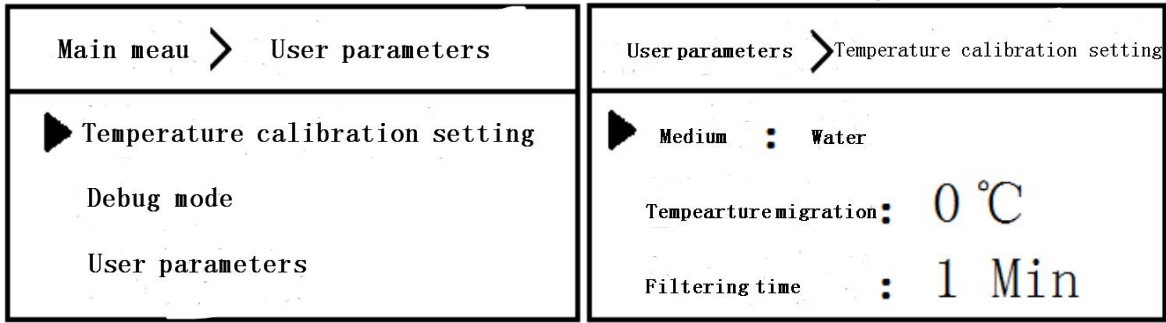
User parameters > Basic setting	User parameters > Basic setting
▶ Measure range: 3000 mm	▶ Measure range: 3000 mm
Sound speed : 1000 m/s	Sound speed : 1000 m/s
Transfer volume: 0 mm	Transfer volume: 0 mm

Measure mode

Press "-" to select the "**measure mode**", select the measurement mode according to the product type, and "confirmation" to return by "return" key.

Main menu > User parameters	User parameters > Measure mode
Basic setting	▶ single probe Temperature calibration
▶ Measure mode	Diameter calibration Double ways calibration
Diameter calibration	

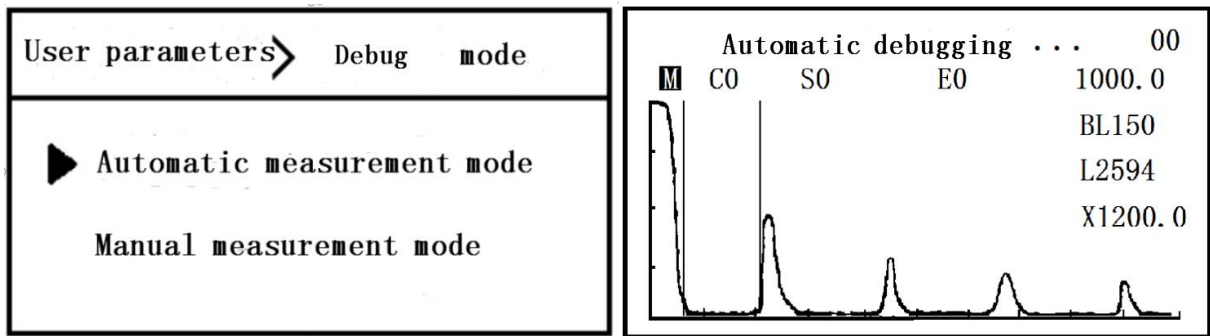
If the "**temperature calibration**" mode is selected, the "**temperature calibration setting**" is also required. Select the "medium" to be measured, and then press the "return" key to return.



temperature calibration setting

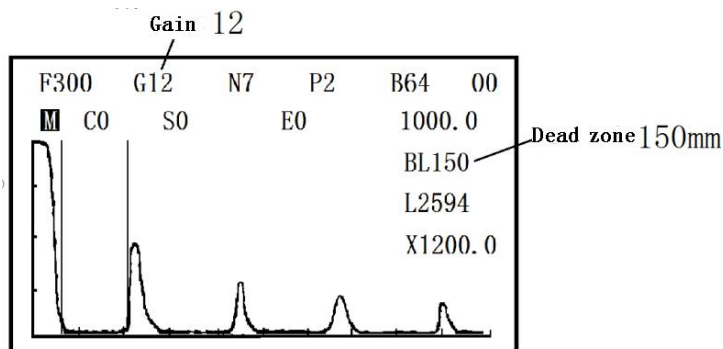
Automatic Debugging

Press the "-" key to select the "debugging mode", and then press the "confirmation" key to enter the "automatic measurement mode". At this time, it will display "in automatic debugging..." and observe the echo waveform until the debugging is completed.



Echo Signal Judgment

After automatic debugging, the wave interface will display a good echo waveform; the upper screen will display the working parameters after debugging, the higher the gain "Gxx" number, the worse the echo signal; the higher the right blind area value "BLxxx" number, the higher the actual dead zone.

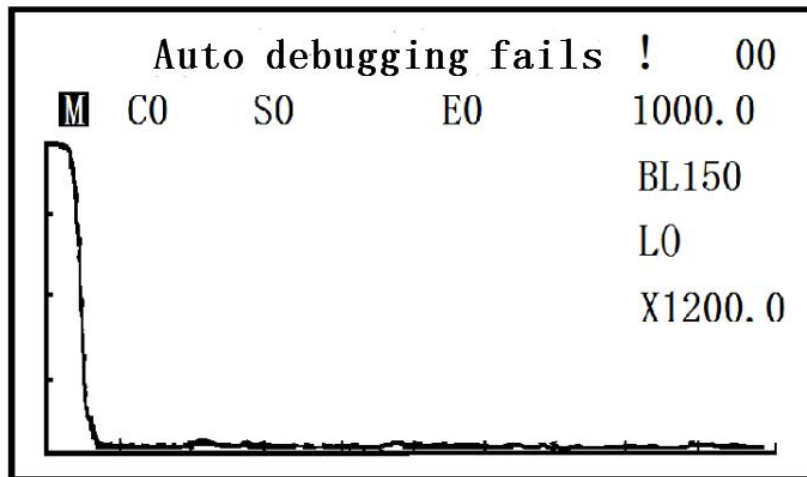


If the gain G and BL are very high, the probe position could be fine-tuned (or change the probe sensor position) so as to minimize the gain and BL value as much as possible. Then the gain and

BL value would be re-adjusted into the "automatic measurement mode" until the signal meets the requirements.

Auto Debugging Fails

If it shows "auto debugging fails", probe sensor is not well installed. Reinstall or change sensor position, then it enters the "**automatic measurement mode**" again until the debugging is successful.



Quality Requirements for Echo Waveform

Gain "Gxx" and blind area "BLxxx", The lower the value, the better.

Waveform noise is small and no clutter interference.

The amplitude of first echo is higher than that of other echoes.

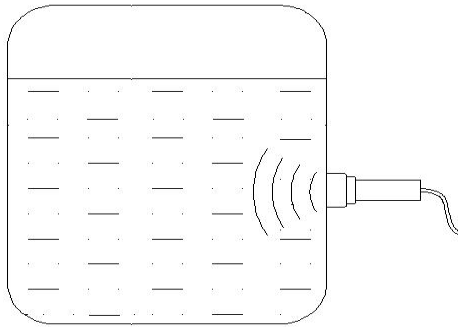
The waveform is smooth and without bifurcation.

The echo position is stable and reliable, and the fault code is 00 (no fault).

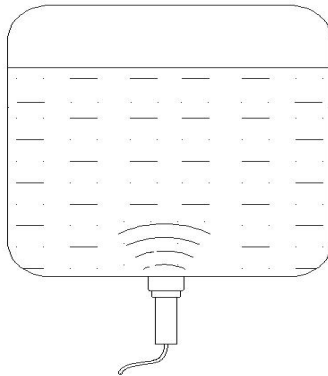
7.3.2 Calibration of medium sound speed

The sound speed value of medium is determined by the known liquid level.

The probe is mounted on the side wall of the tank, and the sound speed of the medium is determined by measuring the distance in the horizontal direction of the tank by using the function of "**known liquid level calibration**".

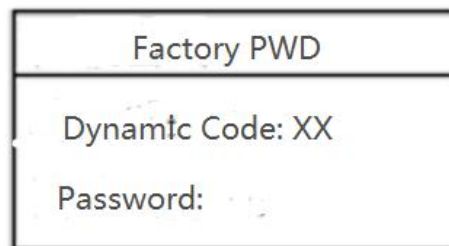
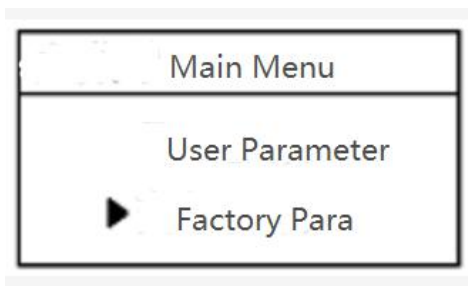


If the liquid level in the tank can be determined by other measurement methods, the probe can also be mounted on the bottom of the tank, and the sound speed of the medium can be determined by using the function of **"known liquid level calibration"**.



When calibrating the sound speed, the parameter setting steps are as follows:

Enter **"Main Menu"**, **"Advanced parameters"**, input the passwords.



The password value is "XX" multiplied by 2 and subtracted by 1.

Enter "Factory Para", press "-" key choose "**Known level cal**", press "confirm" key.



Input the actual measured liquid level as "**known level**", press "**confirm**" key.

The transmitter can automatically calibrate the sound speed of the medium. After the calibration is successful, press the "return" key to return, and the transmitter will work according to the calibrated sound speed.

7.4 Measurement application

After parameter setting, the instrument will save working parameters automatically.

For the same type of tank with the same medium, the sensor probe can be directly mounted on the bottom of the tank to do measurement.

If the measured medium is replaced, sound speed needs to be re-calibrated.

8. Maintenance and Repair

Attention should be paid to keeping the level transmitter clean. Waterproof, moisture-proof, anti-corrosion and avoiding severe collisions and strikes by other objects should be achieved as far as possible.

- Level transmitter and probe should be tested regularly. (The detection period is determined by the user according to the specific situation)

9. Fault handling

Fault	Reason	Solution
Without Display	Power supply error	Charge the transmitter through the adapter.
Level Values Display Instability	Excessive fluctuation of liquid level	Change the installation position of probe or reduce the fluctuation of liquid level.
	Weak echo	Reinstall the sensor probe
Large Measurement Error	Wrong sound speed	Calibrate or modify the sound speed value
No Echo Signal	Liquid level entering dead zone	When the liquid level is higher than the blind area, it will return to normal automatically.
	Sensor Probe Installation error	Reinstall the sensor probe
	Probe or mainframe fault	Contact customer service, repair or replacement.
Display Doubled Liquid Level	Inclination of probe installation	Re-install the measuring probe to ensure that the probe points to the vertical liquid level

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