



Ultrasonic Level Transmitter

AUL730 Series

Operation Manual



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1. Welcome

Sincerely thank you for buying ultrasonic level transmitter!

This manual introduces the application, feature, function, installation and setup of ultrasonic level transmitter so that users can know, install, use and maintain this instrument.

2. Application

- Measure level of pasty, particle material and liquid in non-contact way continuously
- Maximum measurement range

Medium \ Range	Maximum measurement range			
Liquid, fluid	5m	10m	15m	20m
High temperature, vapor	3m	6m	9m	12m

3. Features

- Four change rates, average liquid level can be read accurately even liquid surface fluctuates drastically.
- Six display modes, echo waveform and historical curve can be displayed.
- Internally integrated temperature sensor, compensate sound speed in real time.
- On-site parameter settings by liquid crystal display and keyboard.
- Built-in diagnostic function of 4-20mA current simulation and liquid level simulation.
- Chinese and English displays are available; meter and inch are available.
- Carry out automatic detection of on-site electrical disturbance and interference suppression.
- All input and output lines have overvoltage and overcurrent protection.
- Alarm current output function.
- Non-contact measurement, long service life.

4. Technical Parameters

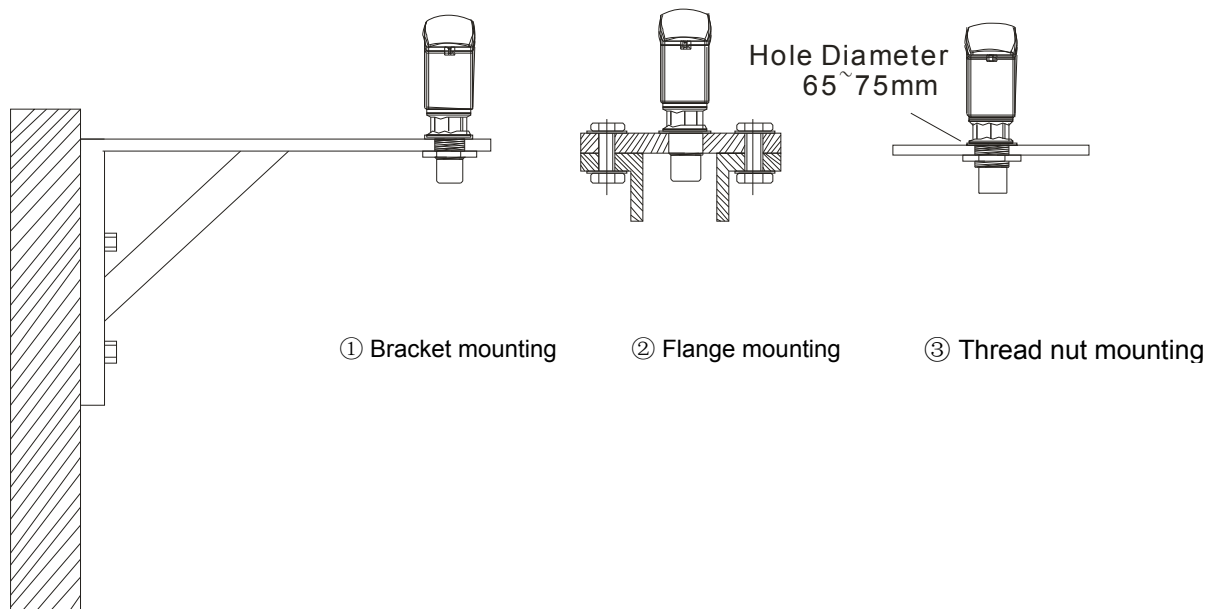
System		Compact version, 2-wire	Separate version, 4-wire
Basic parameters	Measurement range	0~5m, 0~10m, 0~15m, 0~20m	
	Dead band	0.35m	
	Accuracy	±0.25%FS* (standard conditions*)	
	Resolution	±1mm	
Input	Supply voltage	DC12~36V/22mA	DC12~36V/80mA, or AC85V-265V/5W
Output	Simulated current	4-20mA	4-20mA
	Communication	HART 5.0 (optional)	RS485/Modbus-RTU
Contact output		None	4 ways of 3A 250VDC/ 5A 30VDC
Connection	Process connection	G2"	
	Electrical connection	PG9 (water proof)	PG11 (water proof)
Material	Transmitter	ABS	
	Probe	Ordinary waterproof ABS / anti-corrosion ETFE/PTFE	
Probe cable length		None	<150M
Environmental condition	Ambient temperature	-20 °C~+60 °C. Liquid crystal display is failed if it is from -40 °C to -20 °C, but flowmeter still can work normally. If temperature is over -20 °C, display will be returned to normal.	
	Protection class	IP67	IP65
Process condition	Process temperature	-40 °C~+100 °C (Demands should be noted in order if temperature is over +60 °C.)	
	Process pressure	-0.8~ +2.0 BarG / < 2000m altitude (height above sea level)	

*FS: full scale.

*Standard condition: temperature 20 °C±5 °C, humidity 45%~75%, breezeless around, in 1bar air.

5. Mounting

Three mounting methods are available below; please mount transmitter accordingly to site condition:

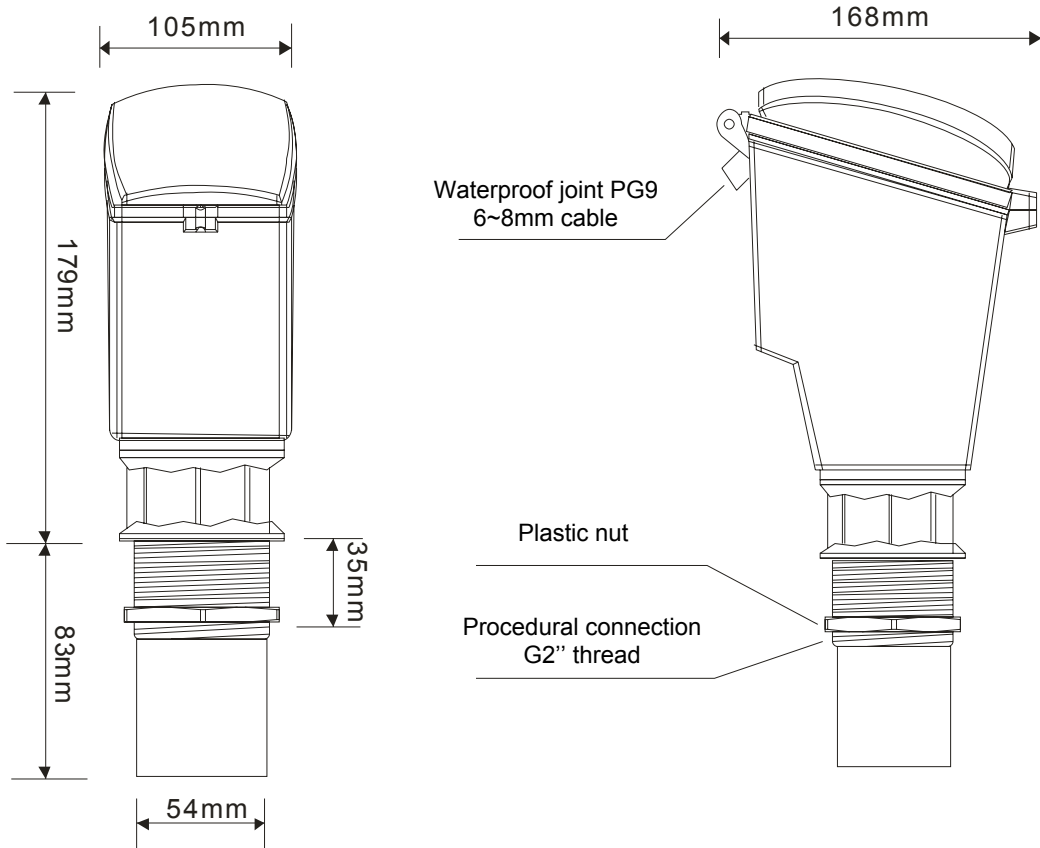


Note:

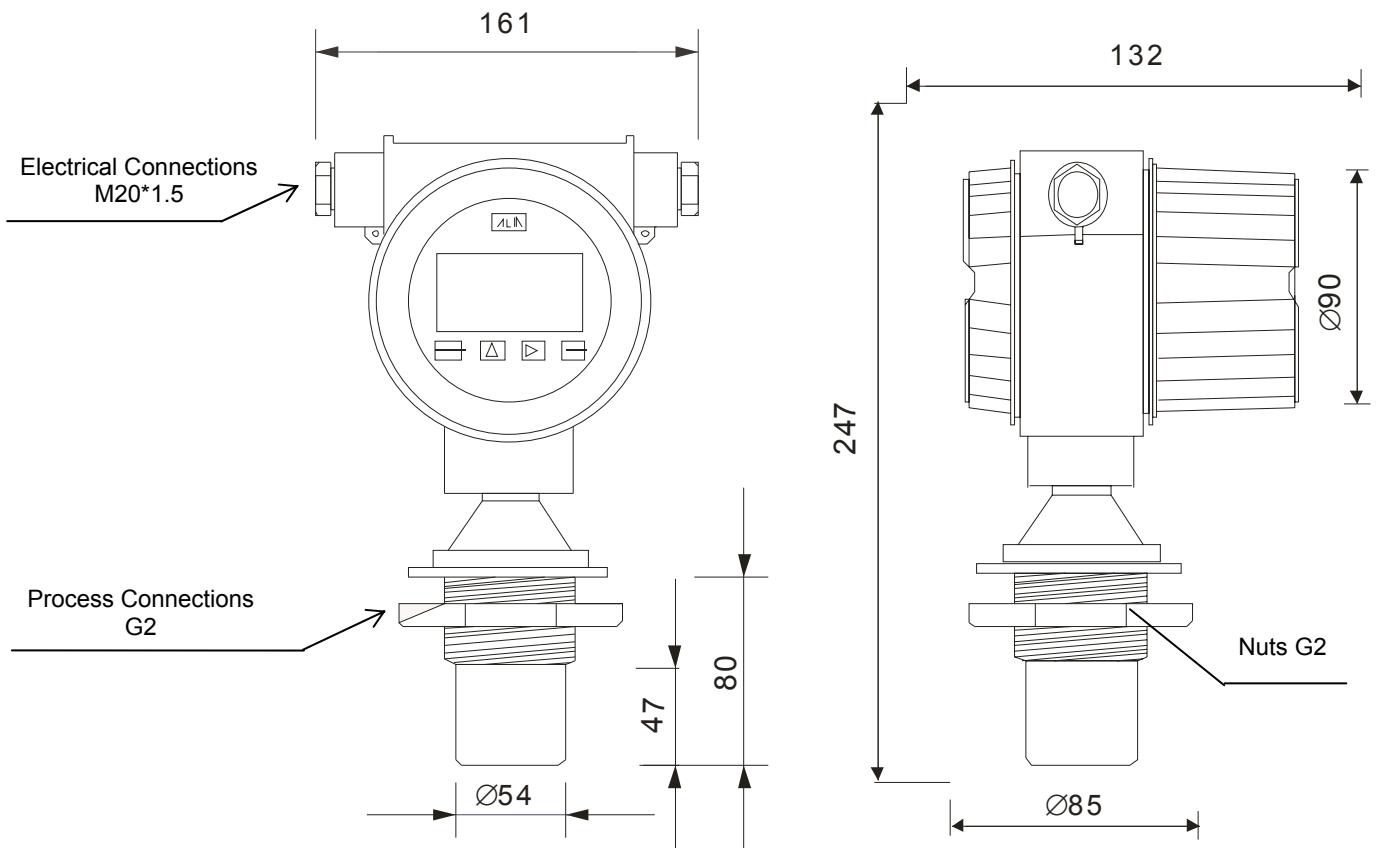
- Plastic nut in probe, easy for user to match different flange specifications.
- Bracket has to be thick and steady to avoid vibration. And vibration should be reduced at where bracket and wall joints.
- Bracket's arm length is recommended to be 30~50cm.

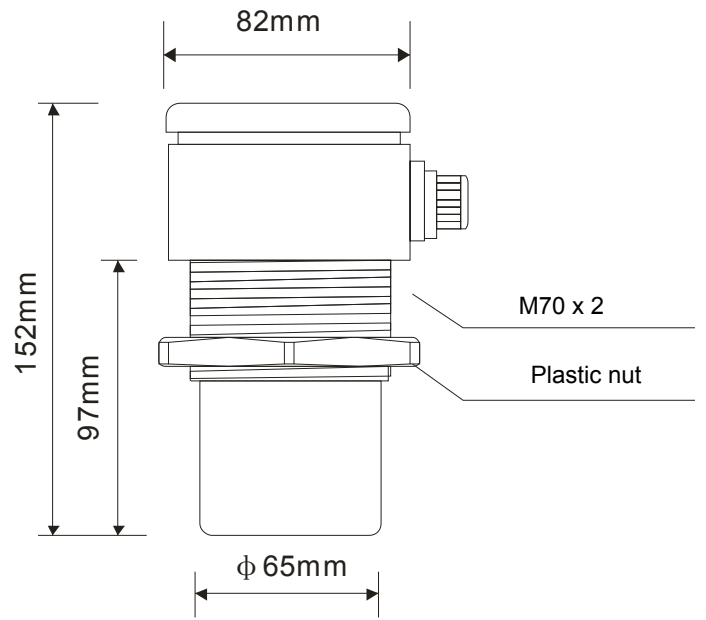
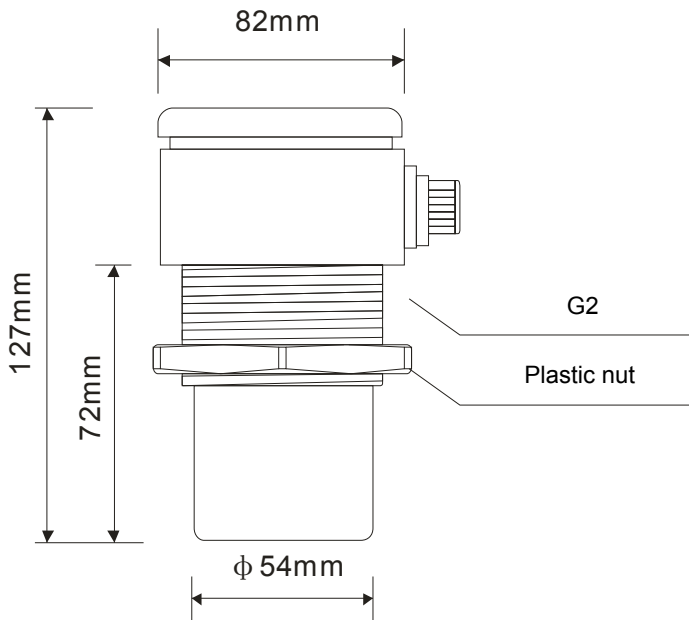
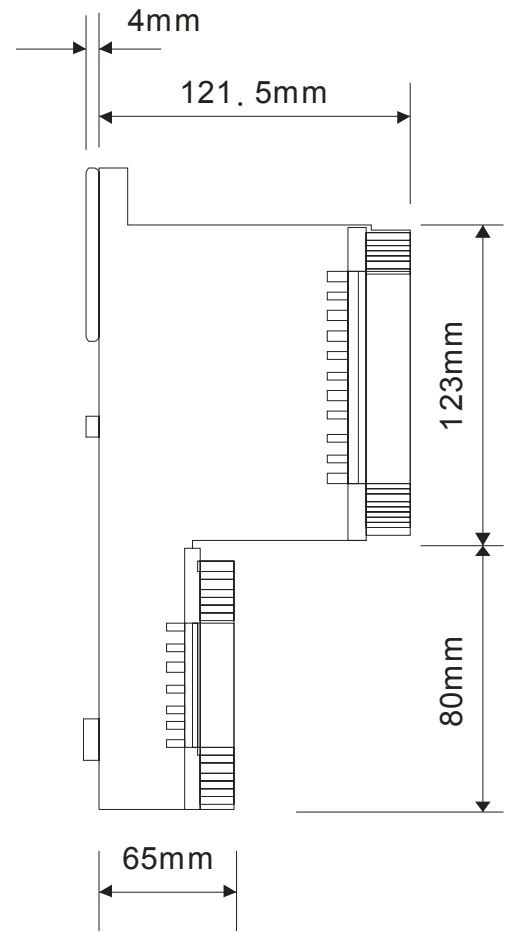
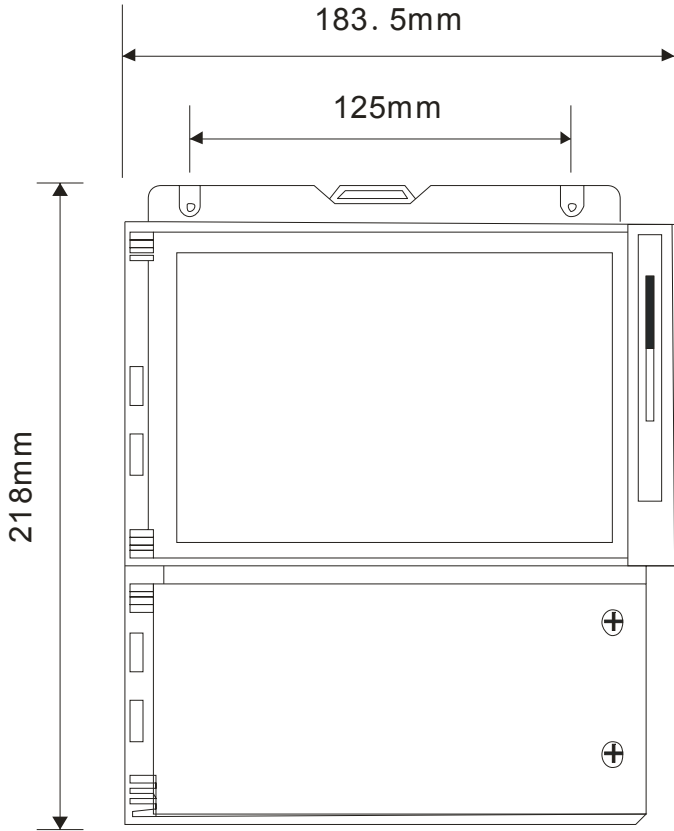
6. Dimensions

6.1 Compact version



6.2 Compact version (explosion proof)



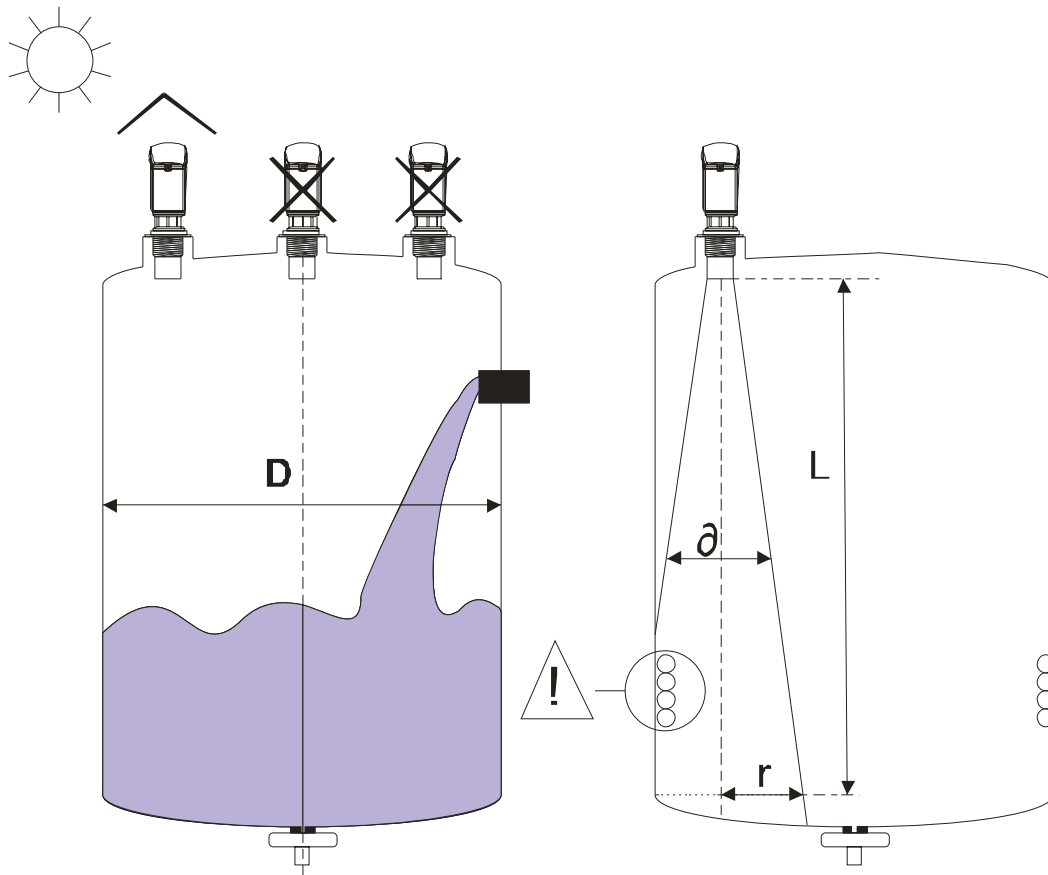


Probe dimensions (when measuring range is 0~5, 0~10, 0~15m)

Probe dimensions (when measuring range is 0~20m)

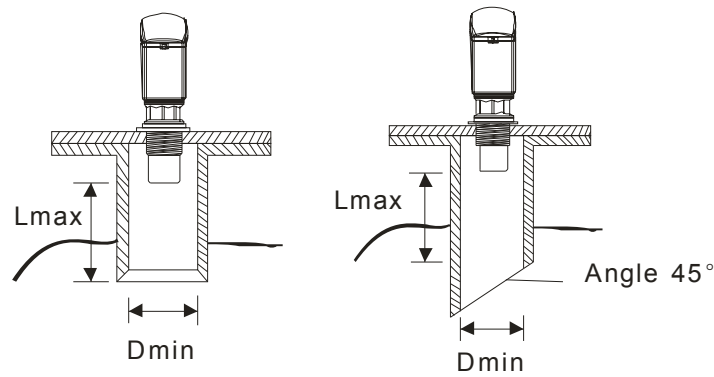
7. Installation Position

- Try to keep liquid level outside of dead band; otherwise extension tube needs to be installed so as to raise probe's installation height.
- The angle between probe and liquid surface should be vertical so as to strengthen liquid surface's reflection. There should NOT be bubbles on liquid surface, otherwise waveguide should be installed.
- Do NOT install two ultrasonic level transmitters in the same tank/pool.
- Do NOT install probe onto the center position of tank vault (except flat tank)
- Probe should be distanced from pipe wall (>30cm).
- Probe's spread angle should avoid obstacles such as rough tank wall, steps, stairs, rail, mixing blade, heating pipe and material-filling pie zone.



8. Extension Tube

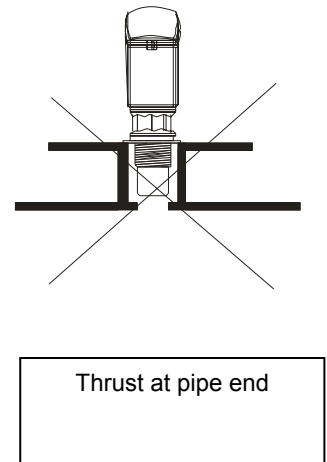
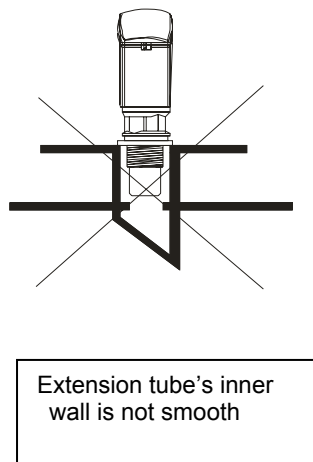
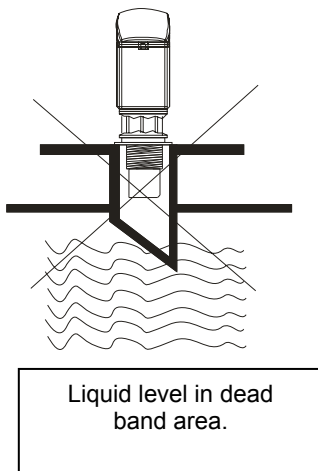
If liquid/material level invades transmitter's dead band, an extension tube needs to be added so as to increase probe's height. Please choose proper size of Lmax and Dmin as shown below:



Dmin	Lmax
80mm	100mm
100mm	150mm
150mm	200mm
200mm	250mm
250mm	300mm

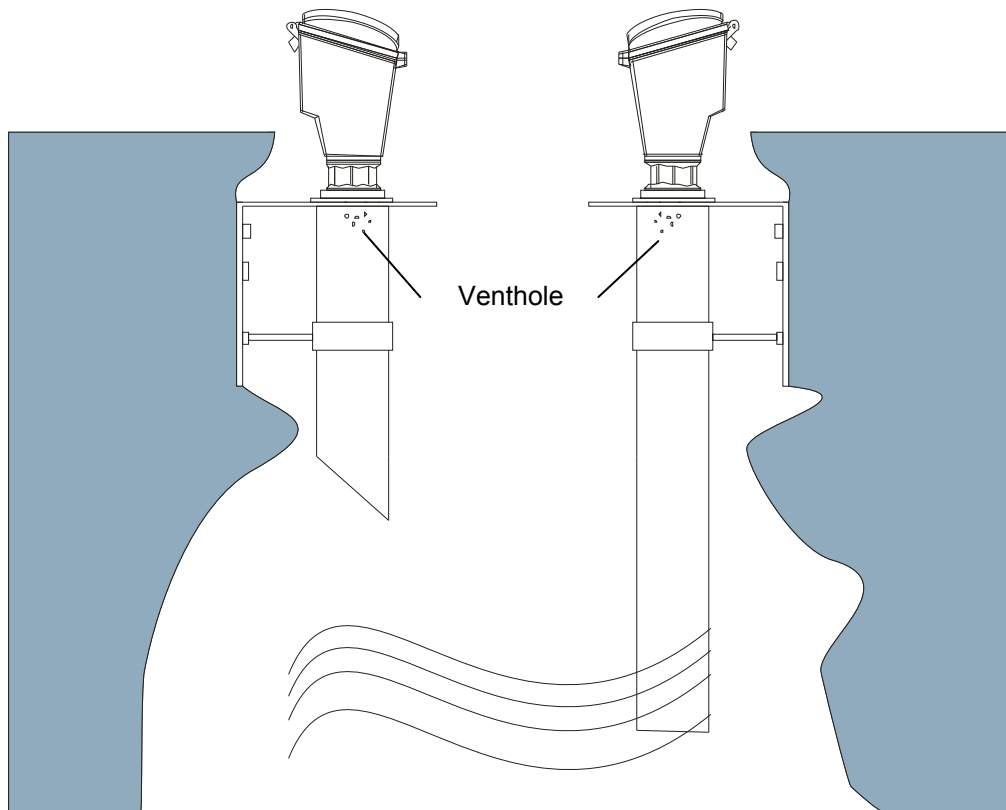
Note:

- The diameter and length of extension tube are regulated. Please refer to data above.
- Inner wall of extension tube should be smooth (no weld and seam). Pipe end should be smooth, if it has 45° chamfer angle, it's the best.
- Extension tube shouldn't be installed as three conditions below:



9. Waveguide

If there is strong echo interference (narrow shaft well, inevitable steps) at site, or vast of bubbles on liquid surface, it's recommended to use PE/PVC pipe (diameter>100mm) as waveguide.

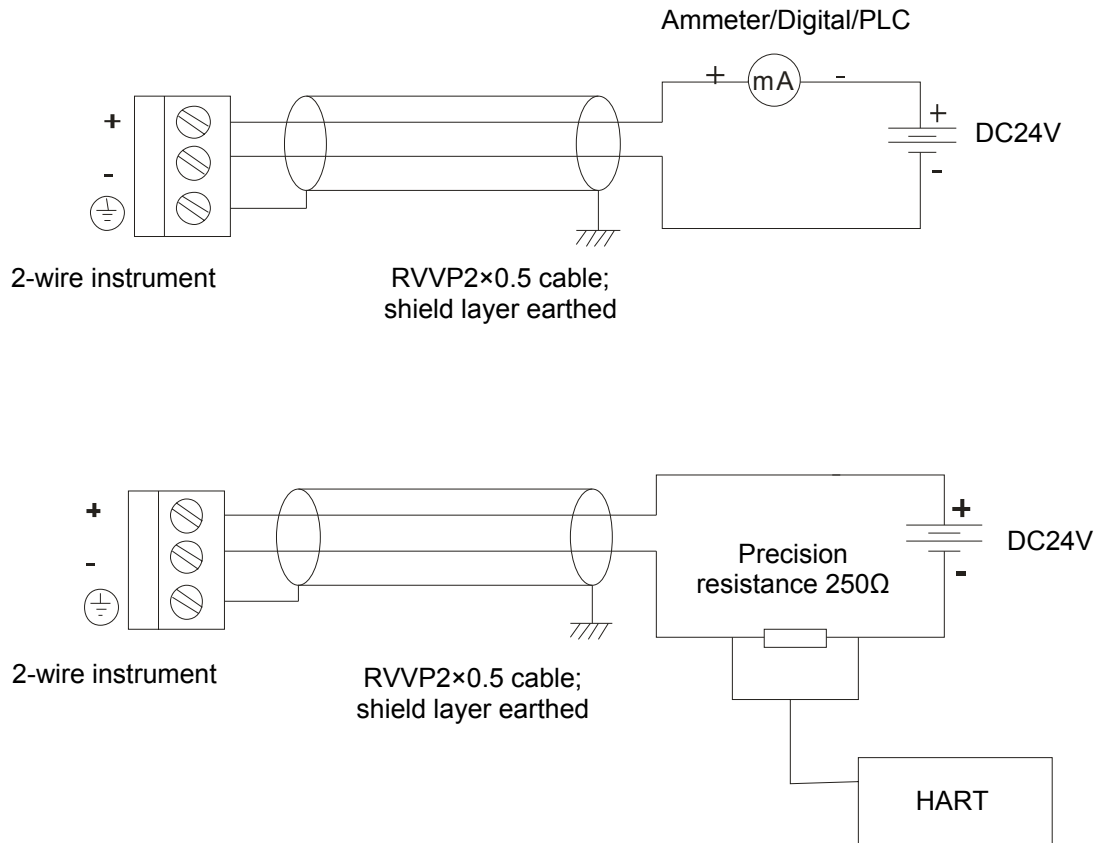


Note:

- There should be venthole on the top so as to make sure liquid level same between inside and outside pipe.
- Inner wall of waveguide should be smooth (no weld and no seam).
- Waveguide's end should be smooth, if it has 45° chamfer angle, it's the best.
- During installation, please take measures reducing waveguide's vibration so as to avoid echo interference.
- Waveguide should be cleaned/checked regularly to make sure it has no material adhered to.

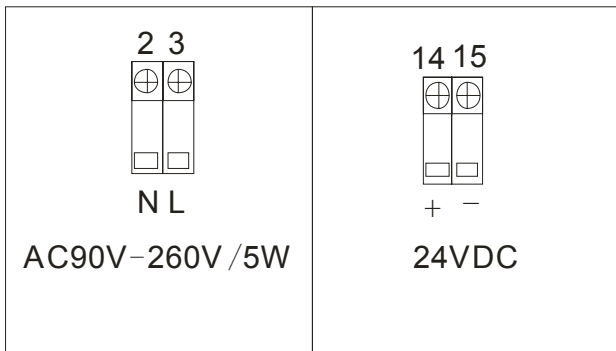
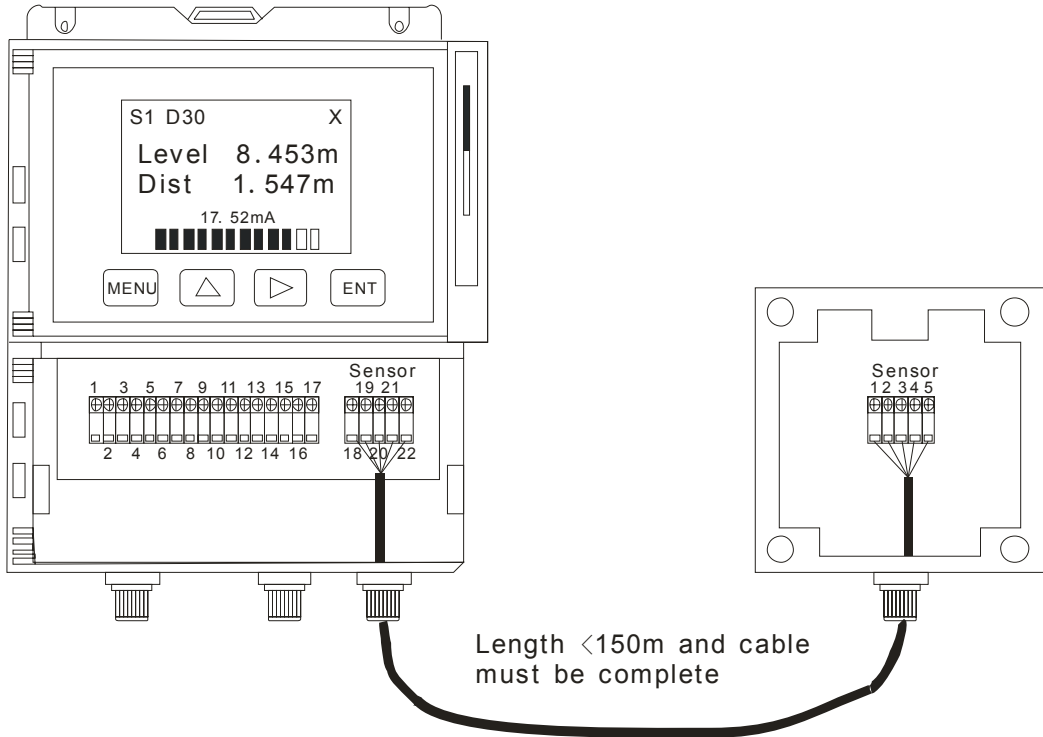
10. Wire Connection

10.1 Compact version

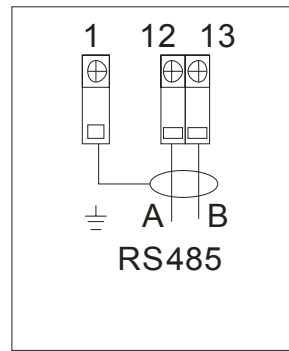


Note:

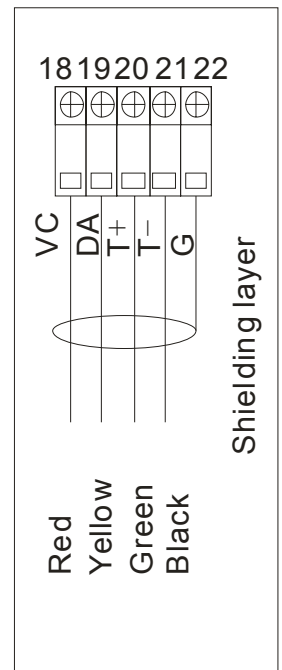
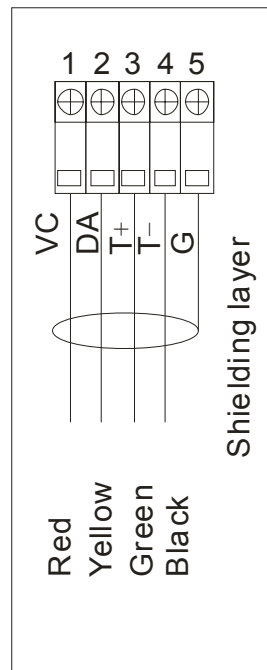
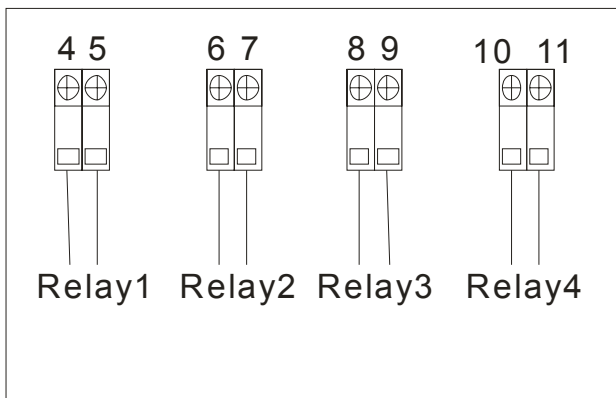
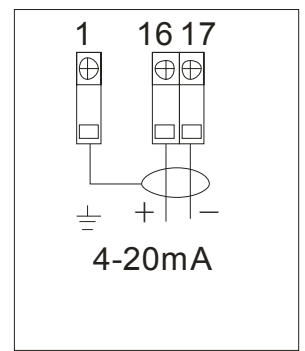
- Transmitter's grounding is very important as ultrasonic level transmitter is weak-current meter.
- To avoid interference, RVVP 2×0.5 shielded cable should be used but shouldn't be routed in the same slot with power cable.
- PLC that's connected with flowmeter should be kept away from converter and high-power electric motor; it shouldn't share the same 24VDC power with converter.
- If transmitter is always under humid environment all the year around, glass adhesive should be coated in cable inlet and cover joint.



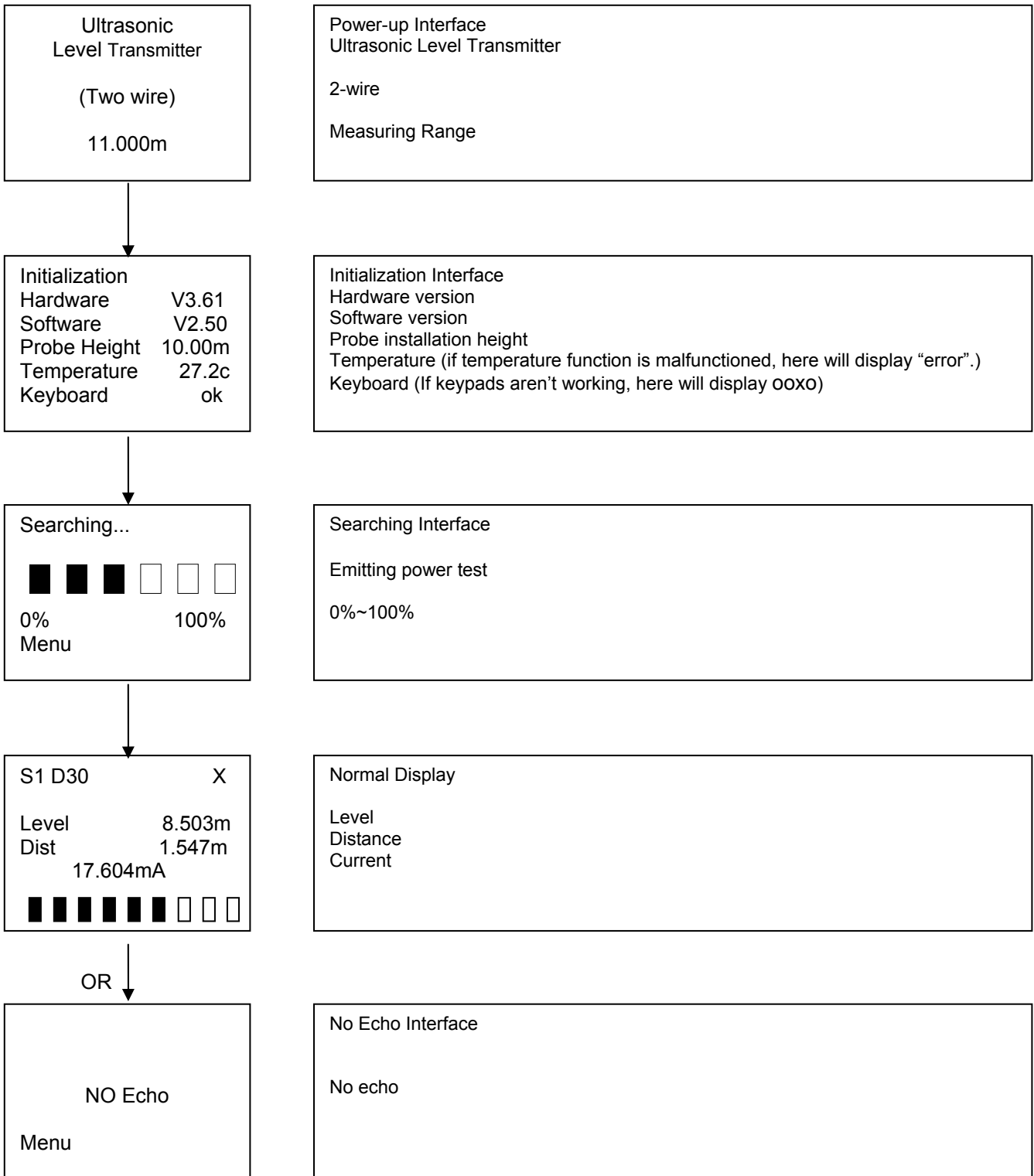
RRV 2*1.0 Cable



RRV 2*0.5 Cable



RRV 4*0.3 Cable

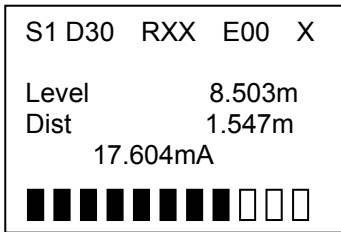


Note:

- Measuring range, hardware version and software version might be unconfirmed to those shown above, please refer to real transmitter display.
- Searching bar's limit is determined by emitting power in menu P44.
- During initialization, if keyboard is found to be abnormal, it will give a hint of which keyboard is not working, namely "O" means normal while "x" means abnormal.
- If keyboard is found to be abnormal, all keyboards will be locked. That's to say, all keyboards will give no response if they are pressed.

12. Display Mode

Four display modes are available.



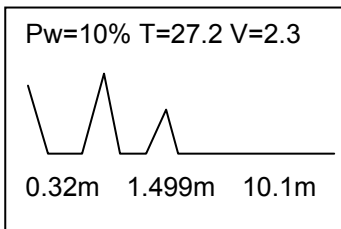
Level Display Mode

This interface shows level, distance and current.
Current value corresponds to level value.



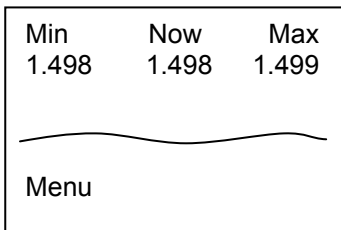
Distance Display Mode

This interface shows distance and current.
Current value corresponds to distance value.



Echo Display Mode



PW: emitting power T: temperature V: echo amplitude
0.32m: dead band 1.499m: present distance 10.1m: measuring range



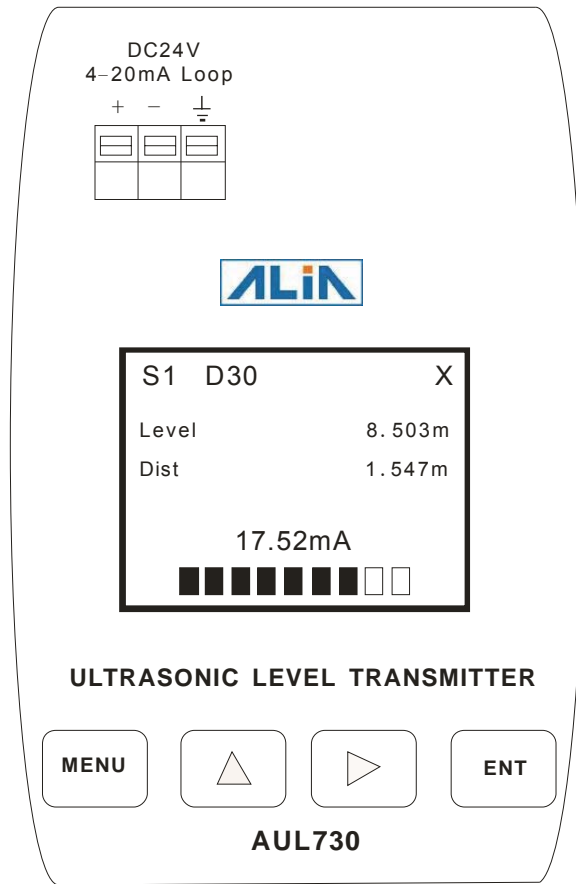
Historical Curve Display Mode

It displays the historical curve of distance in 3 minutes.

Note:

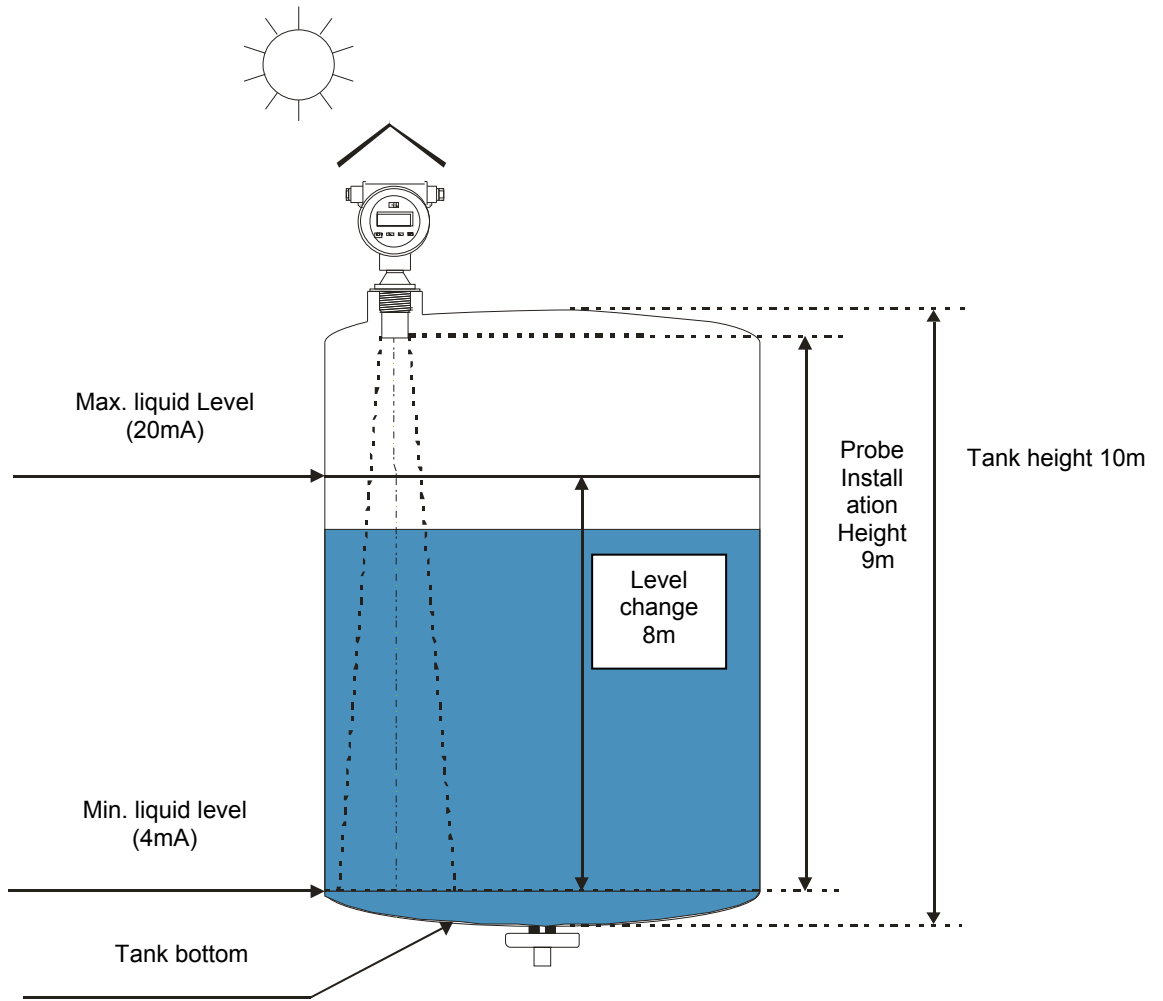
- “S”: response speed. The number 0-3 after “S” respectively means speed level Fast, Normal, Slow, Slowest.
- “D”: damping time. The number after “D” means seconds.
- “R”: relay status. “X” means release while “O” means contact (4-wire only).
- Wave status: “X” means emitting wave while “O” means receiving reflected wave.
- Under any display mode, holding  key can temporarily shift display mode; release  key, system will return to original display after 40s.
- Temporarily shifting display mode will make no difference to current output.

13. Keyboard Information



Name	Button	Function
Setting key		Confirmation. Enter interface or confirm/exit setting.
Up		In menu: this key is used for page down; In working state: hold this key to shift to display mode temporarily. Release it and it will recover to original display mode after 40s. In changing data: this key is used as numerical key.
Right		In menu: this key is used for page up; In changing data: this key is used to move cursor; In echo display mode: this key can enlarge waveform.
Menu		Enter/exit menu.

Tank level measurement



Tank height is 10m and liquid level change is in 8m. After ultrasonic flowmeter is installed, the distance from probe bottom to tank's min. liquid level is 9m.

Parameters are set as below:

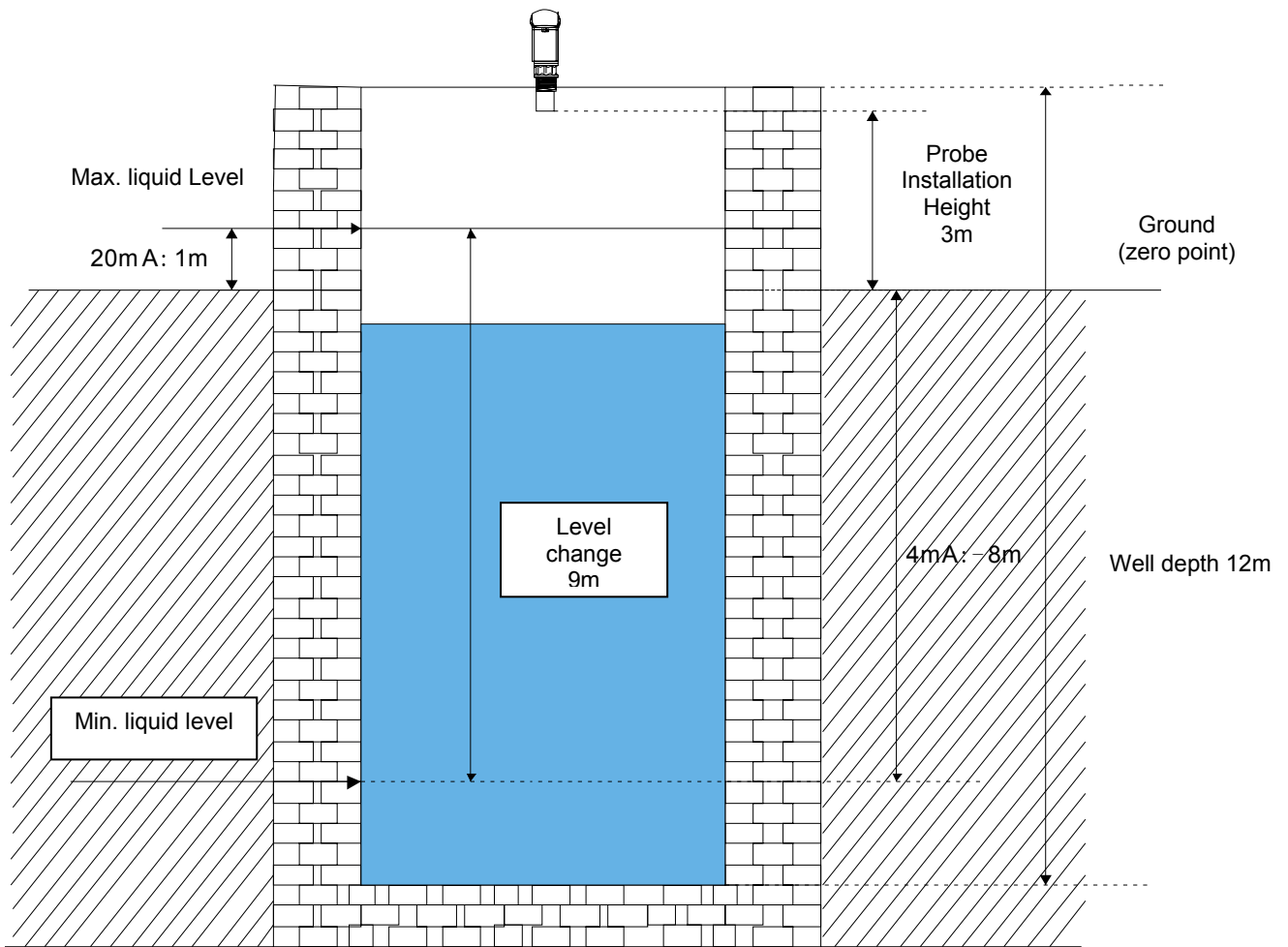
P02 (20mA Setup): 8.000m, see *Basic parameters*.

P04 (Probe Height): 9.000m (probe installation height is from probe bottom to setting zero point. In case 1, ground is taken as zero point. It can be defined on user's need). See *Basic parameters*.

P47 (4mA Setup); -0.000m, see *Advanced Parameters*.

Other parameters remain the same. Then liquid level measurement can be started.

Well Level measurement



Well depth is 12m, 3m higher than ground. To read level directly, here the ground will be taken as zero point. Water level change is 9m, thus the distance from max. liquid level to zero point is 1m, which is equivalent to 20mA; the distance from min. liquid level to zero point is 8m (to reflect relations between liquid level and ground directly, set 4mA: -8.000m). Probe is installed on the well cap, with installation height 3m.

Parameters are set as below:

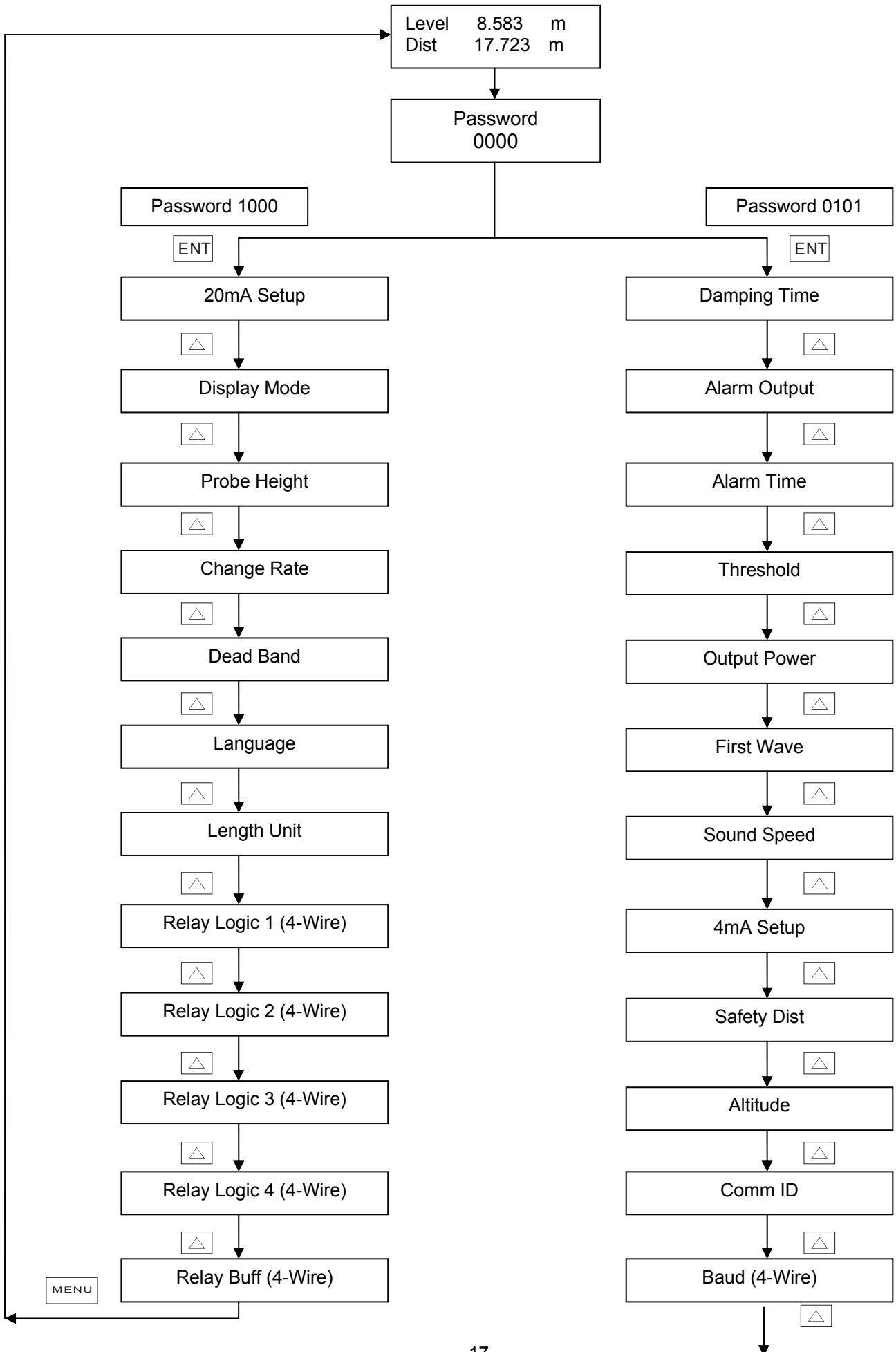
P02 (20mA Setup): 1.000m, see *Basic parameters*.

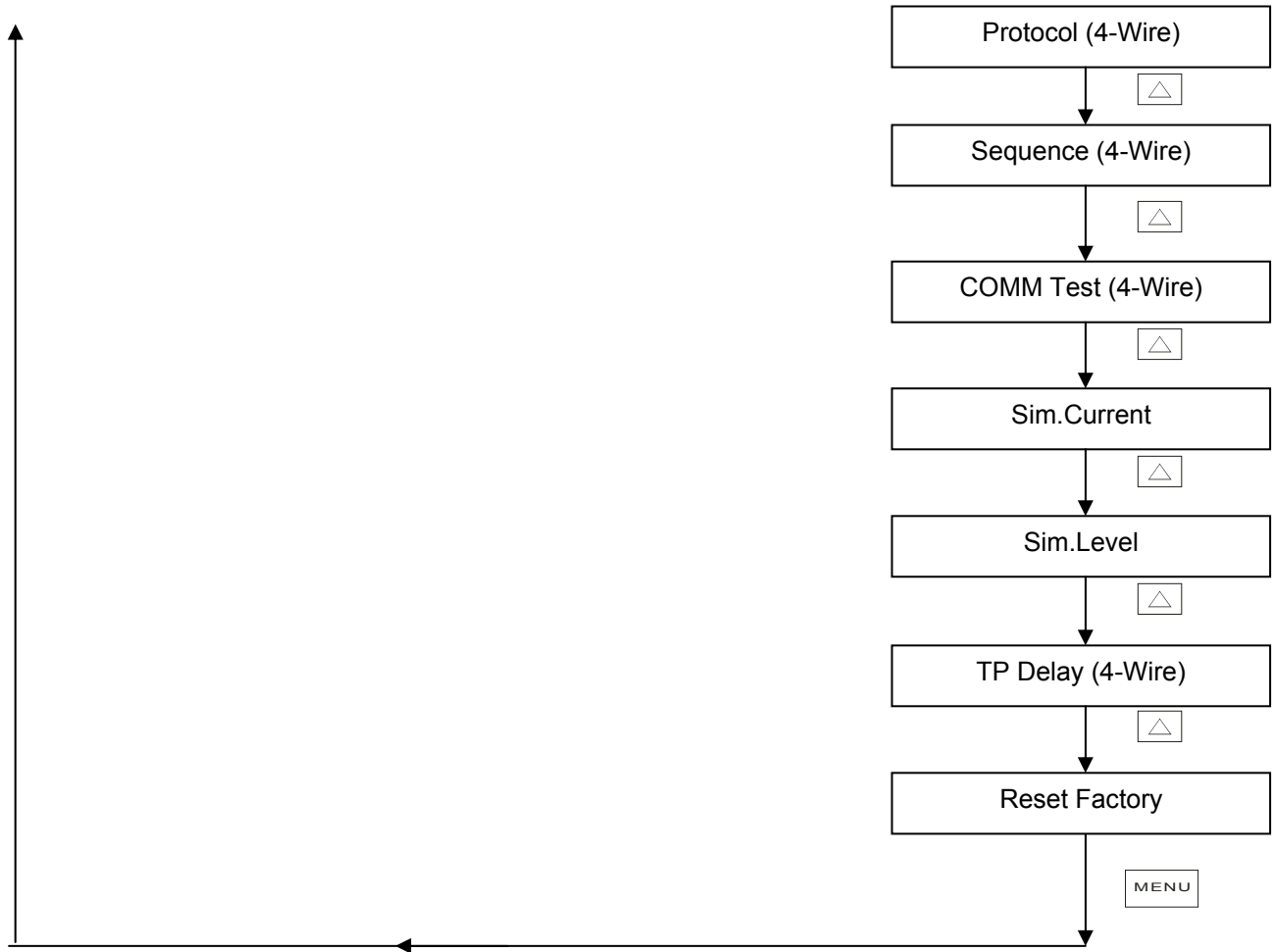
P04 (Probe Height): 3.000m (probe installation height is from probe bottom to setting zero point. In case 2, ground is taken as zero point. It can be defined on user's need). See *Basic parameters*.

P47 (4mA Setup); -8.000m, see *Advanced Parameters*.

Other parameters remain the same. Then liquid level measurement can be started.


14. Menu List





15. Menu Description

Basic parameters (password "1000")

S1 D30 ROOXX E00 X
 Level 8.503m
 Dist 1.547m
 17.64mA


MENU

Please Enter.....
 Password
 >> 0000
 ----- [+] >>>> Enter

ENT

----- Basic Menu -----
 P02 20mA Setup
 >> +20.000m
 Exit [+] [-] Enter

△

Measuring Interface (liquid display mode)

Liquid Level: 8.503m
 Distance: 1.547m
 Current: 17.64mA

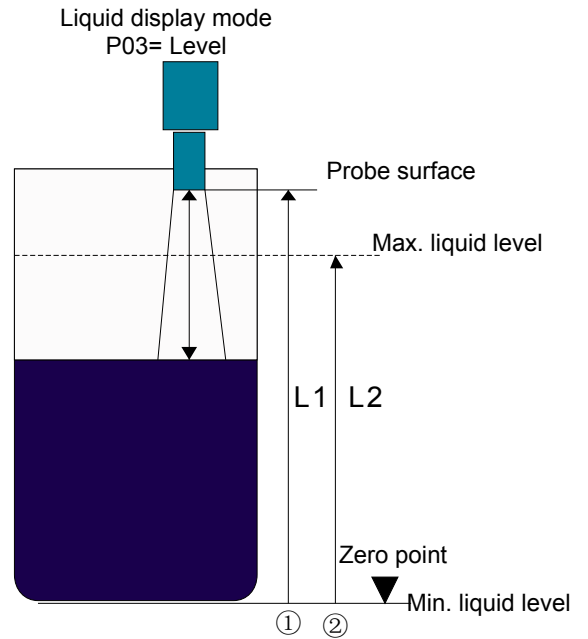
Password Interface

Press **MENU** to enter password interface (basic menu: 1000; advanced menu: 0101).
 Press **△** to increase value, **▷** to move cursor, **ENT** to confirm.

P02: 20mA Setting Interface

Input distance from range high limit to zero point. Range: -20.000m to +20.000m (Default: 10.000).

Press **ENT** and then press **△** to increase value, **▷** to move cursor, finally press **ENT** to confirm.



Menu

P02= L2
 P04= L1
 P47= 0.000m

Note:

- ① L1: distance from probe surface to zero point, namely probe's installation height.
- ② L2: distance from max. liquid level to zero point.

P47, 4mA Setting

```

----- Basic Menu -----
P03  Display Mode
>>  Level
Exit  [+]  [-]  Enter
    
```



P03: Display Mode

Level: display level, distance and current (default)

Distance: display distance and current

Echo Curve: display echo waveform and temperature

History: display historical curve of distance in 3 minutes

Press **ENT** and then **△** to choose mode. Press **ENT** again to confirm.

I Liquid Display Mode

Change rate Damping Relay Threshold Wave Status

S1	D30	RXX	E00	X
Level				8.503m
Dist				1.547m
17.604mA				

4-20mA current

II Distance Display Mode

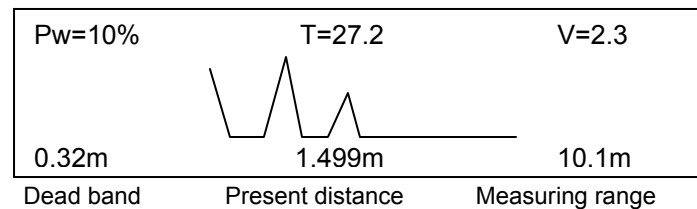
Change rate Damping Relay Threshold Wave Status

S1	D30	RXX	E00	X
Dist				1.547m
17.604mA				

4-20mA current

III Echo Waveform

Power Temp. Echo height



IV Historical Curve Mode (3 minute)

Min. Current Distance Max.

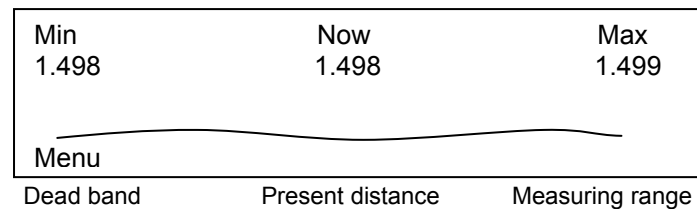





Illustration:





- “S”: response speed. The number 0-3 after “S” means speed level: Fast, Normal, Slow, and Slowest.
- “D”: damping time. The number after it means seconds.
- “R”: relay status. X means release while O means contact (4-wire only).
- Wave status: X means emitting wave while O means receiving reflected wave.
- Under any mode, hold  to shift to display mode temporarily. Release , system will return to original display mode after 40s.
- Current output won't be changed after display mode is shift temporarily.
- In echo display mode, hold  to enlarge waveform.

```

----- Basic Menu -----
P04  Probe Height
>>  +10.000m
Exit  [+ ]  [- ]  Enter
    
```

P04: Probe Height

Input distance from probe surface to zero point. Range: -20.000m to +20.000m (Default: 10.000).

Press  and then  to increase value. Press  to move cursor and then press  to confirm.

For relation between probe height and zero point, please refer to *P02 20mA setting*.






```

----- Basic Menu -----
P05  Change Rate
>>  Fast
Exit  [+ ]  [- ]  Enter
    
```

P05: Change Rate

Set change rate in this window (according to liquid level or distance change).

Fast: the fastest speed, used when liquid level change $\leq \pm 8$ m/minute (default).
 Normal: fast speed, used when liquid level change $\leq \pm 1$ m/minute.
 Slow: slow speed, used when liquid level change $\leq \pm 0.4$ m/minute.
 Slowest: the slowest speed, used when liquid level change $\leq \pm 0.2$ m/minute.

Press  and  to choose option and then press  to confirm.

Note:
 Transmitter's response speed is faster than actual change rate of liquid level. Transmitter's response speed and damping will both influence data stability. The slower change rate is and bigger damping, the more stable data will be. But data will be slow accordingly.

Related menu: P40 damping time



```

----- Basic Menu -----
P06  Dead Band
>>  0.35m
Exit  [+]  [-]  Enter
    
```



P06: Dead Band

Input distance from pipe end, steps or rail to probe and rule out their influence as obstacles. Range: 0~10m, 0.35m is default value.

Press **ENT** and then press **▲** to increase value; press **▶** to move cursor and **ENT** to confirm.

Menu settings
 P02=L4; P04=L2; P47=0.000m; P06=S (See note 2)

Note:

1. L1: distance from probe to obstacle. It should be more than dead band value marked in nameplate, otherwise measurement can't be normal.
2. P06: dead band. S has to be more than distance between probe bottom surface to obstacle.

```

----- Basic Menu -----
P07  Language
>>  English
Exit  [+]  [-]  Enter
    
```



P07: Language

English (default); Chinese.

Press **ENT** and then press **▲** to choose language, finally press **ENT** to confirm.

```

----- Basic Menu -----
P08  Length Unit
>>  meter
Exit  [+]  [-]  Enter
    
```



P08: Unit

Meter (default); feet.

Press **ENT** and then press **▲** to choose language, finally press **ENT** to confirm.

```

----- Basic Menu -----
P10  Relay Logic  1
     >+10.00m
Exit  [+]  [-]  Enter
    
```



P10: Relay Logic 1 (4-wire only)

Relay logic relations:

Simple logic: if liquid level meets condition A, relay will be contact; if not, released.

```

----- Basic Menu -----
P10  Relay Logic  1
     >+10.00  m
     Condition A Symbol
Exit          [+]  [-]  Enter
    
```

Example 1: in the logic above, it means relay will be contact when liquid level > +10m and released when <+10m.

Complex logic: if liquid level meets condition A, relay will be contact; if not, released. If liquid level meets condition B, relay will be released.

```

----- Basic Menu -----
P10  Relay Logic  1
     <+5.00  ^  >+10.00
     Condition A Symbol  Condition
Exit          [+]  [-]  Enter
    
```

Example 2: in the logic above, it means relay will be contact when liquid level descends to 5.00m and released when liquid level rises to 10m.

Related menu: P16 relay buffer.

```

----- Basic Menu -----
P11  Relay Logic  2
    >+10.00m
Exit  [+]  [-]  Enter
    
```



```

----- Basic Menu -----
P12  Relay Logic  3
    <+00.00m
Exit  [+]  [-]  Enter
    
```



```

----- Basic Menu -----
P13  Relay Logic  4
    <+00.00m
Exit  [+]  [-]  Enter
    
```



```

----- Basic Menu -----
P16  Relay Buff
    >> 0.030m
Exit  [+]  [-]  Enter
    
```

P11: Relay Logic 2 (4-wire only)

Function: same as relay logic 1, please refer to menu P10 for more details.

P12: Relay Logic 3 (4-wire only)

Function: same as relay logic 1, please refer to menu P10 for more details.

P13: Relay Logic 3 (4-wire only)

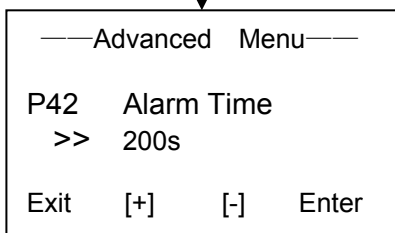
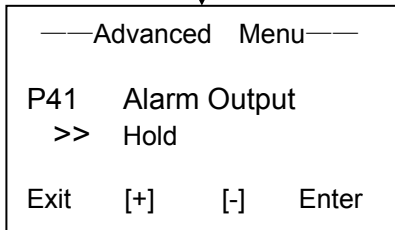
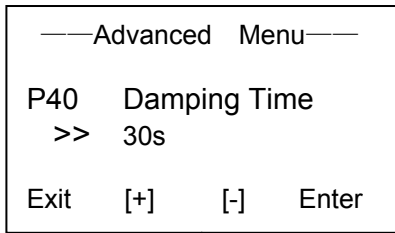
Function: same as relay logic 1, please refer to menu P10 for more details.

P16: Relay Buffer (4-wire only)

To avoid relay reacts frequently when liquid level reaches critical point, relay will not react until liquid level is more/less than logic value. This is called relay buffer. Range: 0.000m~1.000m, default value: 0.030m.

Related menu: P10-13 relay1-4 logic.

For example: If relay alarms when liquid level > 10m and relay buffer is 0.03m, relay will be contact when liquid level >10m and released when liquid level <9.97m; If relay alarms when liquid level < 10m and relay buffer is 0.03m, relay will be contact when liquid level <10m and released when liquid level >10.03m.



P40: Damping Time

It's to stabilize display value. Range: 0s-30s (default:30s).
The smaller damping time is, the less stable data will be; the bigger damping time is, the more stable data will be. Please set damping accordingly.

Press and then press to increase value. Press to move cursor and press to confirm.

P41: Alarm Output

It's to set transmitter's alarm status.

Hold: no alarm (default);
High (22mA): current output 22mA when alarm is on;
Low (3.8mA): current output 3.8mA when alarm is on.

- If there is any fault, when alarm delay is finished, transmitter will report faults to PLC via 4-20mA current.
- If liquid level/distance is more than setting value 10cm in P02, transmitter will alarm via 4-20mA current and display "Level/Dist higher 20mA set".
- If liquid level/distance is more than setting value 10cm in P47, transmitter will alarm via 4-20mA current and display "Level/Dist lower 4mA set".
- If liquid level/distance is in safety distance, transmitter will alarm via 4-20mA current and display "Level/Dist enter Safe-Dist".
- If transmitter search signals for a long time, it will be forced to output 3.8mA current to give alarm and display "No Echo".

Press and then press to increase value. Press to move cursor and press to confirm.

Related menu: P02 20mA settings
P42 alarm delay
P47 4mA settings
P48 safety distance settings

P42: Alarm Time

It's to avoid relay reacts frequently when liquid level reaches critical point.
Range: 1s~200s (default: 200s).

When alarm delay terminates, transmitter will report fault to PLC via 4-20mA current.

Press and then press to increase value. Press to move cursor and press to confirm.

Related menu: P41 alarm output settings

—Advanced Menu—
 P43 Threshold
 >> 0.3V
 Exit [+] [-] Enter



P43: Threshold

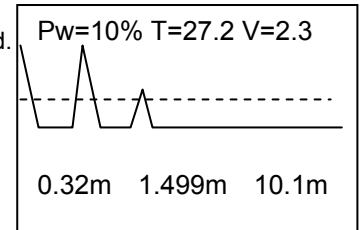
If grounding still couldn't solve interference problem, threshold is used to strengthen transmitter's anti-interference ability. The bigger value is, the stronger anti-interference ability. However, it will reduce transmitter's sensitivity.

- 0.0V: threshold unused.
- 0.3V: ignore echo that is lower than 0.3V (default)
- 0.6V: ignore echo that is lower than 0.6V
- 0.9V: ignore echo that is lower than 0.9V
- 1.2V: ignore echo that is lower than 1.2v

Press **ENT** and then **△** to choose option, finally pres **ENT** to confirm.

Note:

- Dashed line in the right means threshold.
- Increasing threshold will reduce transmitter's sensitivity.



—Advanced Menu—
 P44 Output Power
 >> 0-100%
 Exit [+] [-] Enter



P44: Output Power

It's to set probe's output power. Transmitter will adjust itself to suitable output power automatically.

- 0~30%: output power 0-30%
- 0~60%: output power 0-60%
- 0~100%: output power 0-100% (default)
- 100%: output power always 100%.

Press **ENT** and then **△** to choose option, finally pres **ENT** to confirm.

```

    ——Advanced Menu——
    P45  First Wave
    >>  1.0*
    Exit  [+]  [-]  Enter
    
```



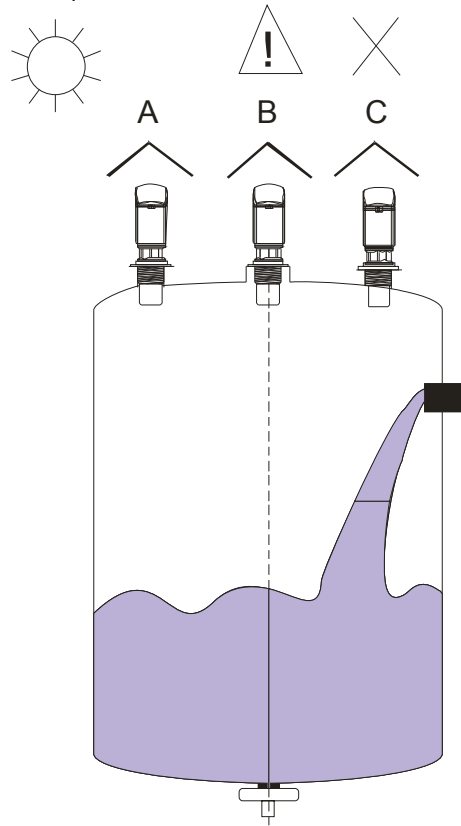
P45: First Wave

Level transmitter is NOT allowed to be installed at center of vault tank as it may cause frequent reflection. If it's unavoidable, please refer to this menu to ensure transmitter's normal work.

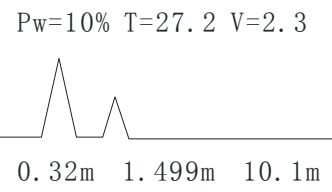
Range: 0.0~5.0 times, default value: 1.0*.

Press **ENT** and then press **△** to increase value. Press **▷** to move cursor and press **ENT** to confirm.

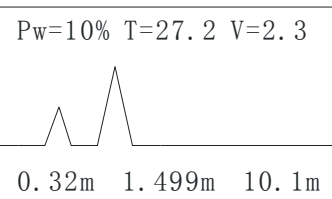
Example:



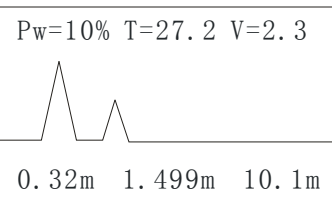
Echo curve of position A



Echo curve of position B



Echo curve of position C



1. As shown above, echo curve of position A means proper installation while B in the center of tank vault. From A&B curves, it can be seen that first wave is liquid echo. Thus first wave parameter needs to be magnified.

2. if installation position is unavoidable to position like C, from its curve, it can be seen that first wave is interference echo and more than liquid echo. If second echo is liquid echo, choose 0.0* to eliminate interference echo.

```

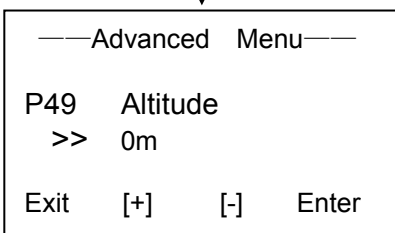
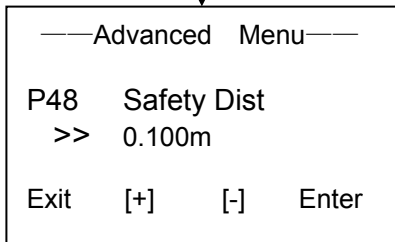
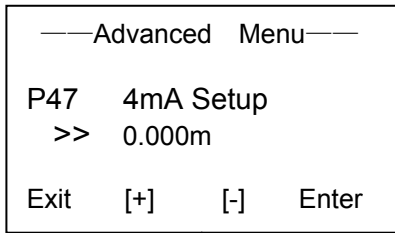
    ——Advanced Menu——
    P46  Sound Speed
    >>  331m/s
    Exit  [+]  [-]  Enter
    
```



P46: Sound Speed

If transmitter is to be used situation where gasoline, alcohol and acetone are used, sound speed has to be changed so as to properly measure distance and material level as ultrasonic wave's speed is not 331m/s in these highly-volatile gases.

Press **ENT** and then press **△** to increase value. Press **▷** to move cursor and press **ENT** to confirm.



P47: 4mA Setup

Input distance from range low limit to zero point. Range: -20.000 to +20.000 (default: 0.000).

Press **ENT** and then press **△** to increase value. Press **▷** to move cursor and press **ENT** to confirm.

Note:

- If min. liquid level is higher than zero point, value will be positive; if lower, negative. Please refer to “P02 20mA” for relations between min. liquid level and zero point.
- In most cases, min. liquid level means bottom of tank, bottom of pool and zero point. So its default value is 0.000m.

Related menu: P02 20mA settings

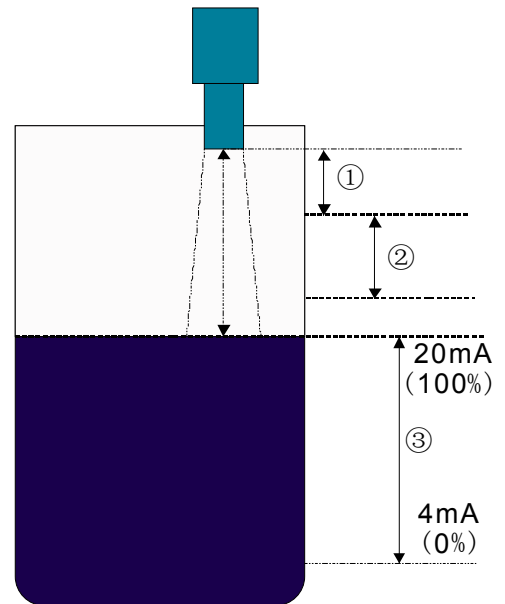
P48: Safety Distance

To prevent accident if liquid level enter transmitter’s dead band, there will be safety distance out of dead band. Range: 0.000~5.000m, default: 0.100m.

Press **ENT** and then press **△** to increase value. Press **▷** to move cursor and press **ENT** to confirm.

The picture below illustrates relations among dead band, safety distance, liquid level and liquid level’s range.

- ① Dead band
- ② Safety distance
- ③ Liquid level’s range



P49: Altitude

Input zero point’s altitude. Range: 0~3000m (default: 0m).

Press **ENT** and then **△** to increase magnification. Press **▷** to move cursor and then **ENT** to confirm.

Altitude is used to display liquid level; it won’t influence distance and current output. It will not be used if “P02 20mA” and “P47 4mA” are to be set.

```

  ——Advanced Menu——
P50  Comm ID
  >> 01#
Exit  [+]  [-]  Enter
  
```



```

  ——Advanced Menu——
P51  Baud
  >> 4800Bd
Exit  [+]  [-]  Enter
  
```



```

  ——Advanced Menu——
P52  Protocol
  >> ModBus-RTU
Exit  [+]  [-]  Enter
  
```



```

  ——Advanced Menu——
P53  Sequence
  >> 1234
Exit  [+]  [-]  Enter
  
```



```

  ——Advanced Menu——
P54  Comm Test
  >> .....
Exit  [+]  [-]  Enter
  
```



P50: Communication ID

Range:
 HART: 0~15# (default: 0#)
 RS485: 1~99# (default: 1#)

Press and then press to increase value. Press to move cursor and press to confirm.

Note:
 As required by HART communication, if transmitter's address isn't equal to 0, transmitter will output 4.000mA current constantly and it has nothing to do with liquid level (distance).

P51: Baud Rate (4-wire)

1200Bd: baud rate 1200Bd
 2400Bd: baud rate 2400Bd
 4800Bd: baud rate 4800Bd (default)
 9600Bd: baud rate 9600Bd
 19200Bd: baud rate 19200Bd

Press and to choose value, then press to confirm.

P52: Communication Protocol (4-wire)

ModBus-RTU: conform to ModBus standard RTU protocol

Press and to choose value, then press to confirm.

P53: Sequence (4-wire)

1234: sequence of 4-bytes float point (default)
 4321: sequence of 4-bytes float point
 3412: sequence of 4-bytes float point
 2143: sequence of 4-bytes float point

Press and then press to choose value, then press to confirm.

Please pay attention to sequence of 4-bytes float point required from DCS/PLC. sequence of 4-bytes float point in transmitter should be conformed to those in DCS/PLC.

P54: Communication Test (4-wire)

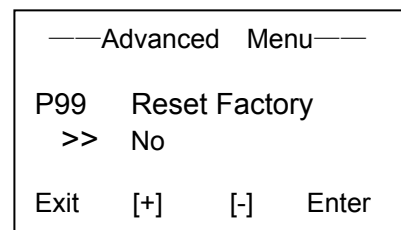
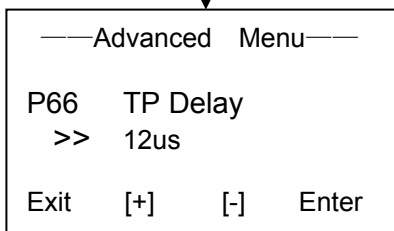
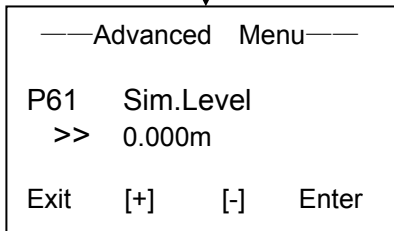
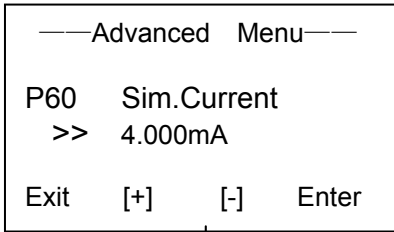
```

P54 Comm Test
RX: xxxxxxxxxxxxxxxx
TX: xxxxxxxxxxxxxxxx

Device ID=1      4800Bd
                  Exit
  
```

P54 communication test
 Hexadecimal, display receiving data
 Hexadecimal, display sending data
 Transmitter ID Baud rate
 Press to exit.

Note:
 If transmitter receives fault data, it will display fault information rather than send data.



P60: Current Simulation

- 4.000mA: force transmitter output 4.000mA current
- 8.000mA: force transmitter output 8.000mA current
- 12.000mA: force transmitter output 12.000mA current
- 16.000mA: force transmitter output 16.000mA current
- 20.000mA: force transmitter output 20.000mA current

Press **ENT** and then press **△** to choose value, transmitter will output chosen current.
Through this menu and external ammeter, current output can be confirmed whether to be normal or not.

P61: Liquid level Simulation

- 0.000m: simulate liquid level 0.000m
- 2.000m: simulate liquid level 2.000m
- 4.000m: simulate liquid level 4.000m
- 6.000m: simulate liquid level 6.000m
- 8.000m: simulate liquid level 8.000m
- 10.000m: simulate liquid level 10.000m

Press **ENT** and then press **△** to choose value, transmitter will output 4-20mA current of chosen liquid level.
By simulating liquid level (from settings in "p47 4mA" and "P02 20mA"), 4mA and 20mA can be confirmed whether to be consistent between transmitter and digital meter/PLC.

P66: Temperature Delay (4-wire)

- 12us: probe cable<30m
- 18us: probe cable 30~60m
- 24us: probe cable 60~100m
- 30us: probe cable 100~150m

Press **ENT** and then **△** to choose value, then press **ENT** to confirm.
Cable length, cable size and temperature will influence signal's temperature delay time.

P66: Reset Factory

- No: no
- Yes: reset factory

Press **ENT** and then **△** to choose value. Press **ENT** to confirm.

Appendix 1: HART Command (2-wire only)

Command 0	● Read identification code
Command 1	● Read main process variables
Command 2	● Read current of main process variables and percentage
Command 3	● Read dynamic process variables and current of main process variables
Command 6	● Write polling address
Command 11	● Read marked identification code
Command 12	● Read information
Command 13	● Read tag, descriptor and date.
Command 14	● Read main process variables' sensor information
Command 15	● Read device information
Command 16	● Read final assemble number
Command 17	● Write information
Command 18	● Write tag, descriptor and date
Command 19	● Write final assemble number
Command 33	● Read transmitter's process variables
Command 34	● Write process variables' damping
Command 35	● Write process variables' range high limit and range low limit
Command 36	● Change main process variables' present value to range high limit
Command 37	● Change main process variables' present value to range low limit
Command 40	● Enter/exit constant current mode of main process variables
Command 43	● Change device's present process variables to zero point
Command 44	● Write unit of main process variables
Command 45	● Adjust DAC zero point of main process variables' current
Command 46	● Adjust DAC gain of main process variables' current
Command 49	● Write sensor's serial number of main process variables

Appendix 2: Modbus-RTU Protocol (4-wire)

With ModBus-RTU protocol, AUF730 communicates with DCS/PLC/computer via RS485 interface. Please refer to table below for transmitter register address details. Liquid level, distance and temperature occupy “2 registers, 4 bytes” respectively. Data format is IEEE754 float point. Float point’s sequence can be set through P53 settings.

Initial Address	16 bits Register		Description
0000H	0000 DCBA		Relay
0002H	SEEE EEEE	EMMM MMMM	Liquid Level
	MMMM MMMM	MMMM MMMM	
0004H	SEEE EEEE	EMMM MMMM	Distance
	MMMM MMMM	MMMM MMMM	
0006H	SEEE EEEE	EMMM MMMM	Temperature
	MMMM MMMM	MMMM MMMM	

Default settings for RS485 serial port:

Baud rate: 4800

Stop bit: 1

Parity: none

ID: 01

Baud rate and ID can be set directly in transmitter.

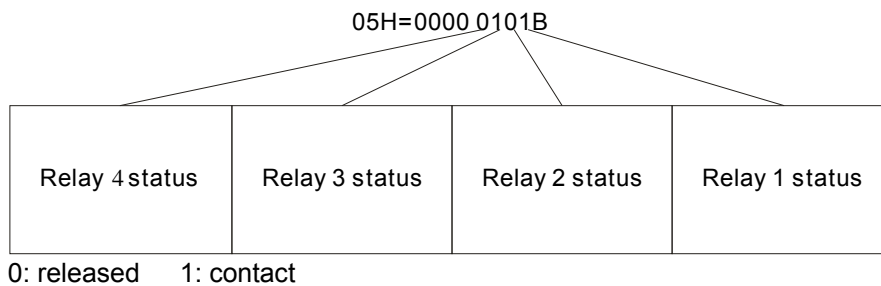
1. Read relay status (functional code 01H)

Check data frame (namely transmitter’s data protocol sent from PLC and computer, 8 bytes totally)

Data 01H 01H 00H 00H 00H 04H 3DH C9H

Response data frame (namely PLC and computer’s data protocol sent from transmitter, 6 bytes totally)

Data 01H 01H 01H 05H 91H 8BH



2. Read liquid level data (functional code 03H)

Check data frame (namely transmitter’s data protocol sent from PLC and computer, 8 bytes totally)

Data 01H 03H 00H 02H 00H 02H 65H CBH

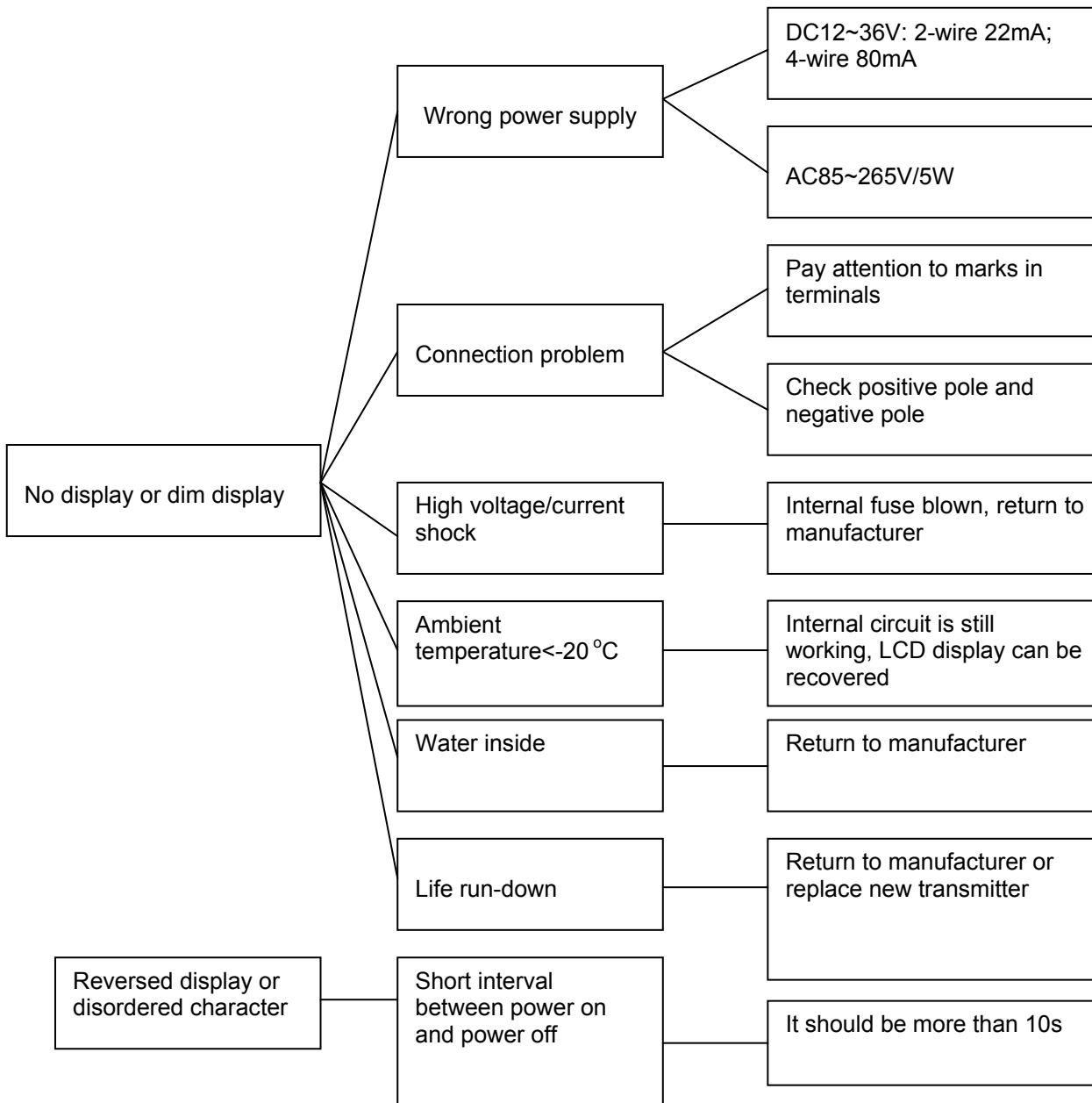
Response data frame (namely PLC and computer’s data protocol sent from transmitter, 9 bytes totally)

Data 01H 03H 04H 40H 64H 49H BAH 18H 0FH

0x406449BA: float point number of IEEE754 format, it means liquid level is 3.567m.

16. Troubleshooting

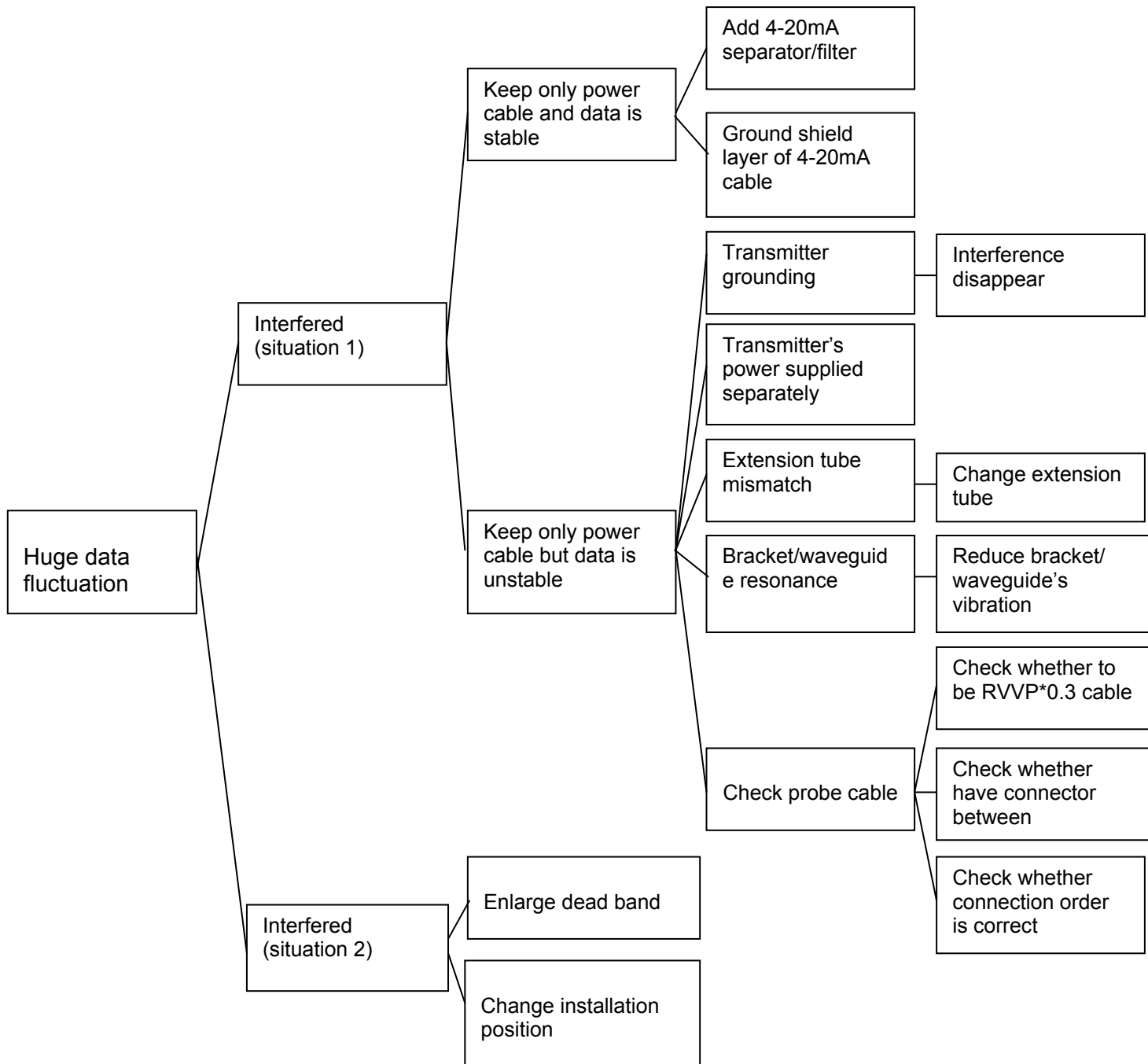
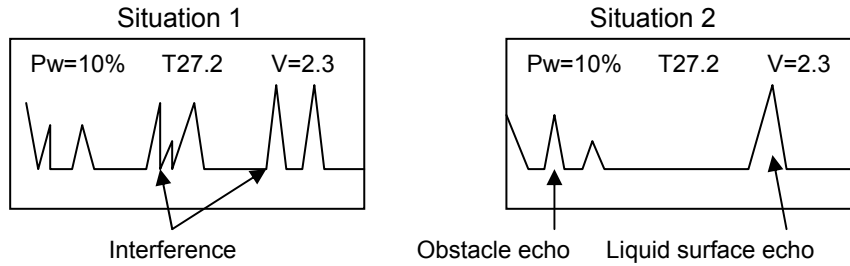
(1) No display, reversed display or unrecognizable character



Note:

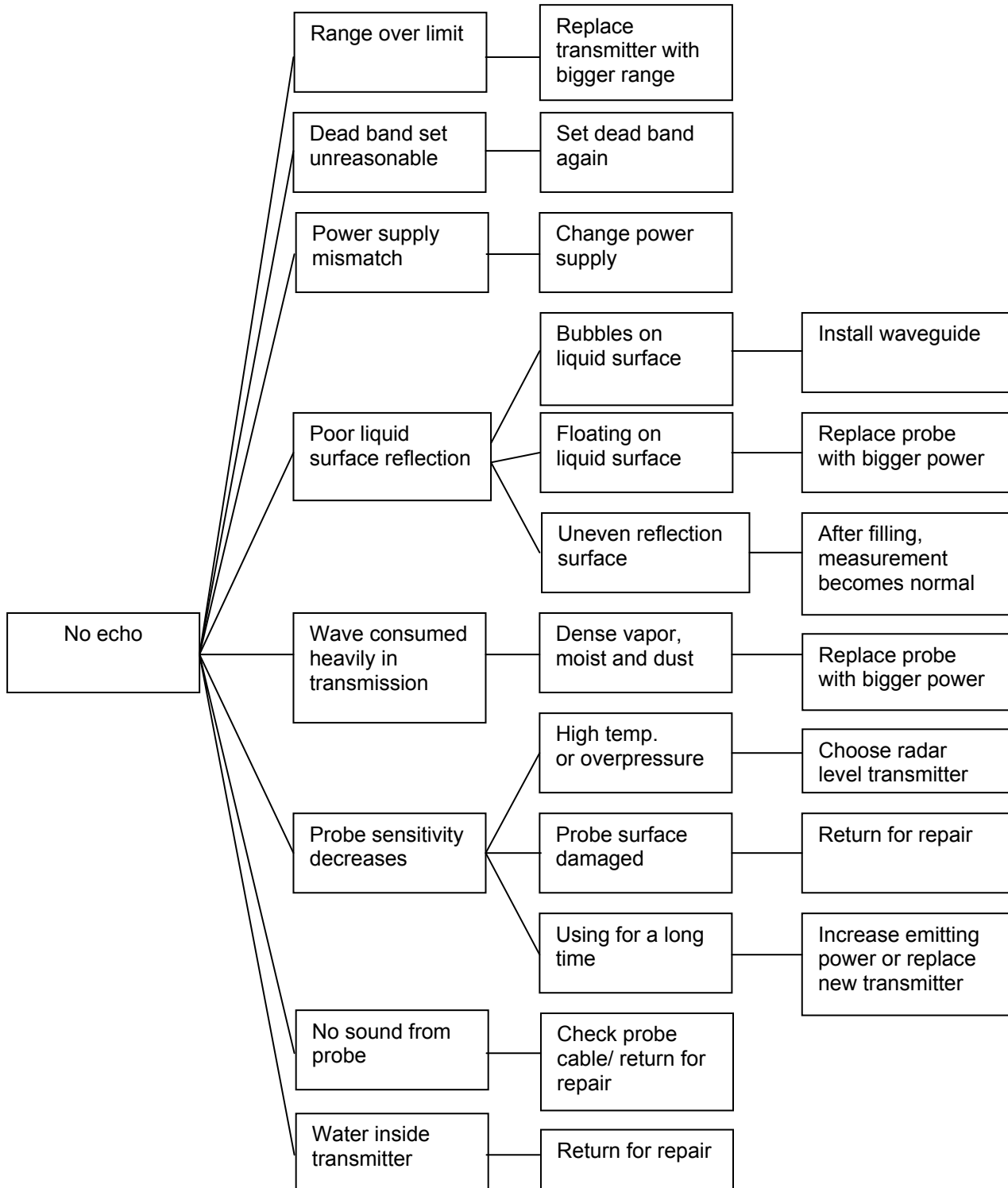
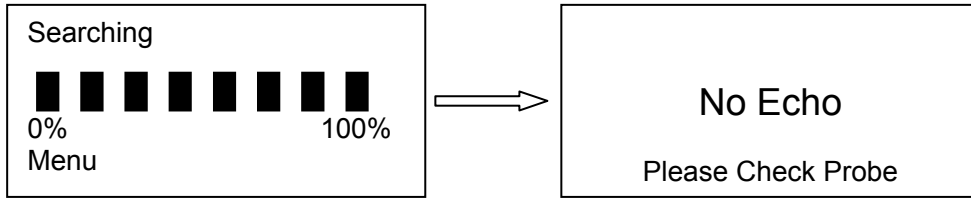
- Add a sun-proof/rainproof shield to strengthen transmitter's life.
- Coat glass cement at waterproof connector or housing gap if transmitter is to be exposed to humid environment all the year round.

Echo curve:

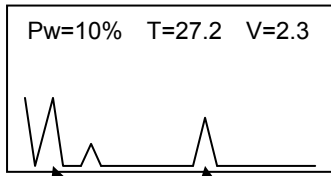


Note:

- As transmitter is weak-current, it needs to be grounded well.
- The cable of 4~20mA should be shielded cable and have its shielded layer grounded separately.



#1: read obstacle's echo



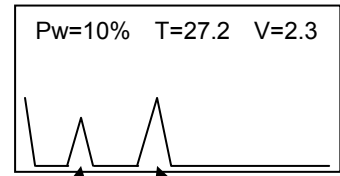
obstacle's echo liquid surface's echo

#2: read obstacle's secondary echo

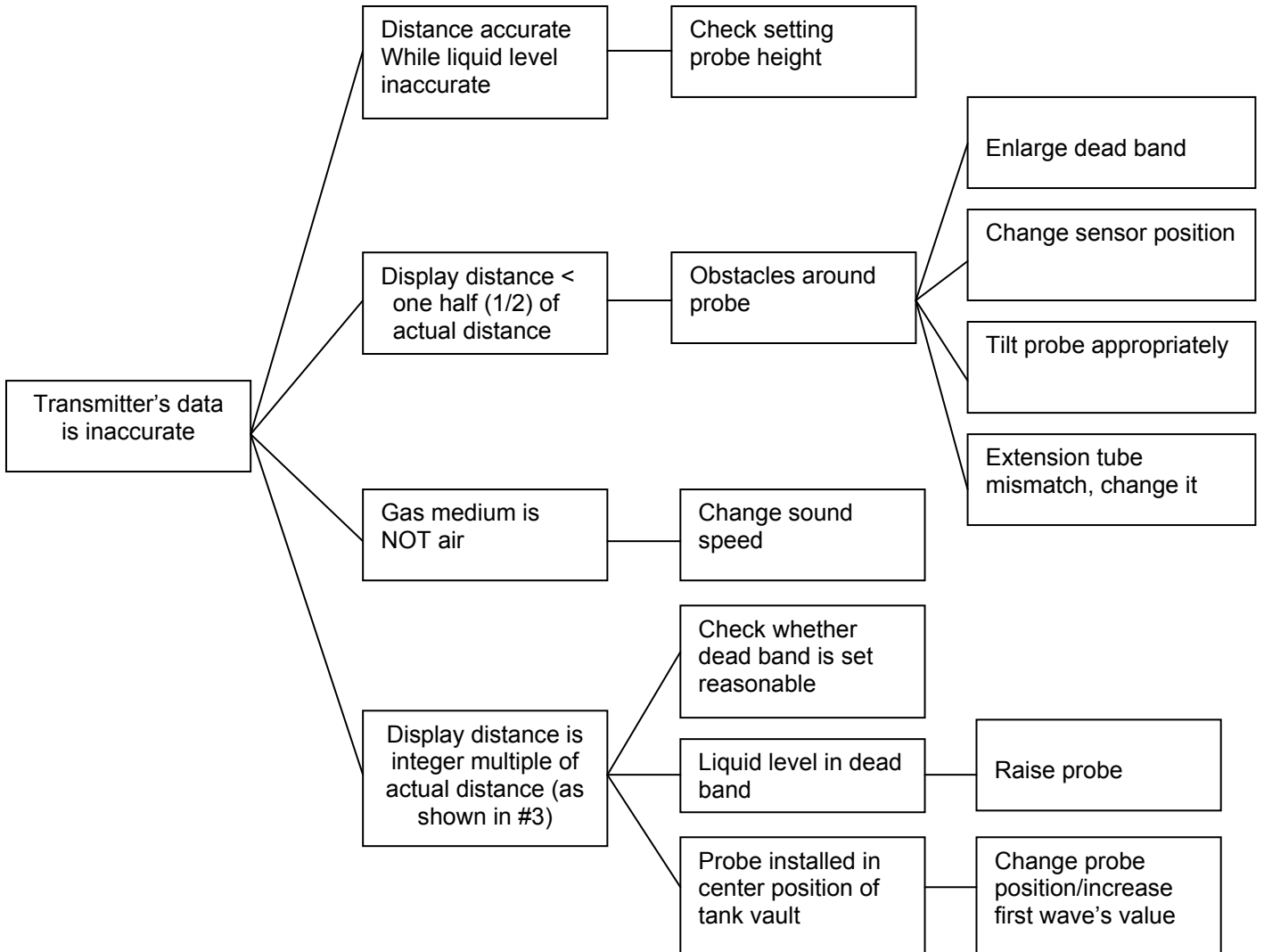


pipe end's echo pipe end's secondary echo liquid surface's echo

#3: read liquid surface's secondary echo

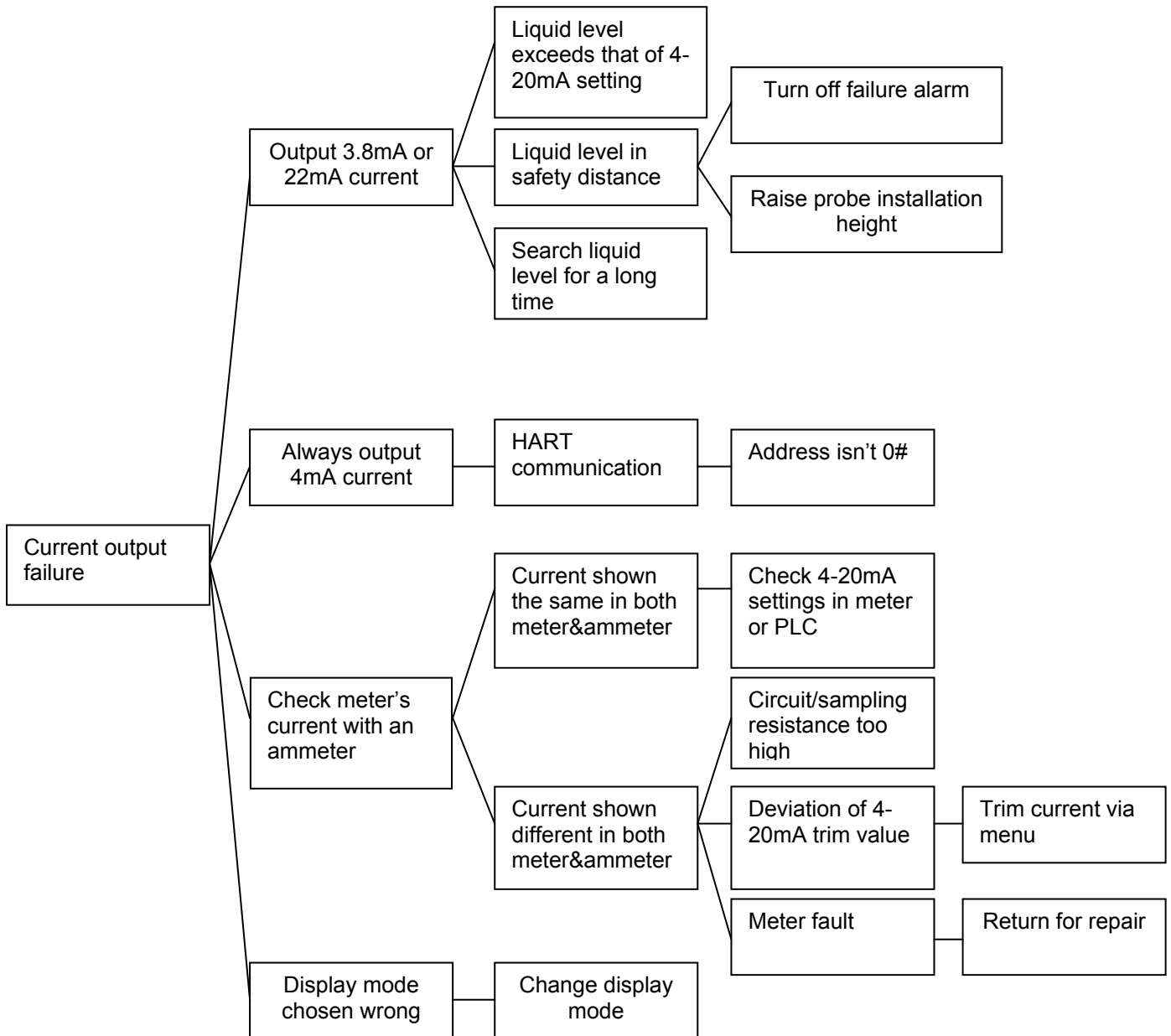


liquid surface's echo secondary ech echo



Related menu:

- P04: probe installation height
- P06: dead band
- P45: first wave
- P46: sound speed



Note:

For 2-wire transmitter, its initial current will be 3.8mA after powered up. It will output current according settings in “P02: 20mA/p47: 4mA” after liquid level is searched.

