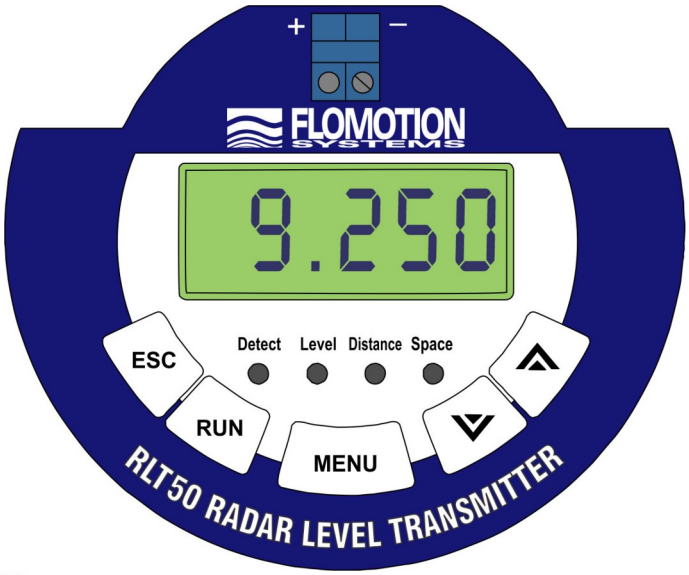
FLOMOTION SYSTEMS RLT50

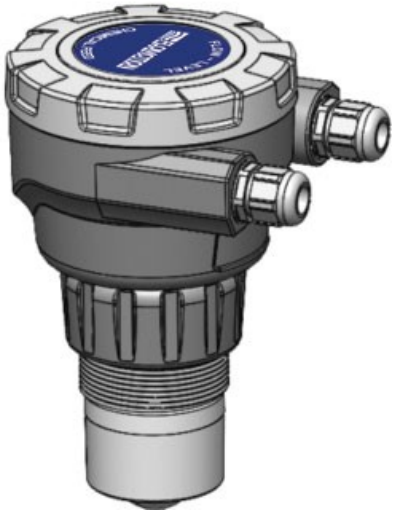
Radar Level Transmitter

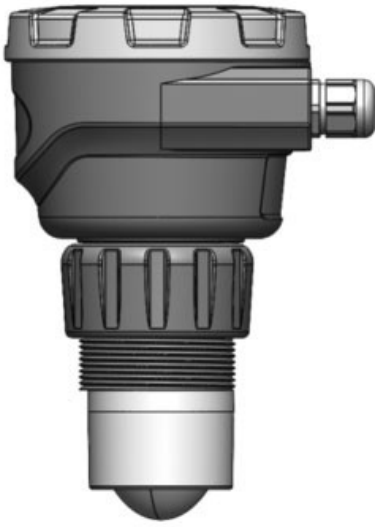
USER'S MANUAL

March, 2026

RLT50 Radar Level







Flomotion Systems Inc.
3 N. Main St
Middleport, NY 14105
Toll Free: (800)909-3569 (U.S. & Canada)
Tel: (716)691-3941
info@flomotionsystems.com
www.flomotionsystems.com

Index

Introduction

This is the operating manual for the radar level meter RLT50. Before installing and operating the level meter, and before servicing or inspecting it, you should read this manual and be familiar with its contents.

This product is to be installed in an environment that meets the waterproof and explosion-proof ratings. We are not responsible for any accidents that occur due to installation in an environment that requires a higher level of rating than the waterproof or explosion-proof rating of this product.

The following symbols are used to call the user's attention to important matters in this manual.

If you ignore warnings, the product can be damaged

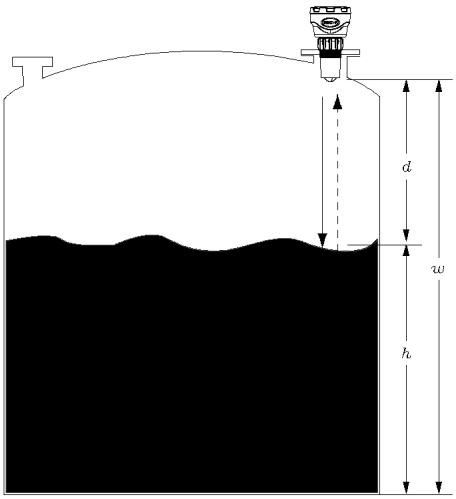
If you ignore cautions, the measurement value can be inaccurate

It provides an additional information

Please note that the contents of this manual are subject to change without prior notice if the product is modified, upgraded or improved.

Chapter 1

Overview



The RLT series is a radar level meter that calculates distance by measuring the time it takes for a radar pulse transmitted from a transducer to reflect from the surface of the object being measured and return. The measured value is displayed on the LCD of the level meter. Also, the measured value is converted into a current value and output through the output terminal for connecting with an external device.

Distance = (Time of Flight x radar velocity) / 2

d: from the radar lens empty to surface of the target
h: Height of the target
w: from the radar lens to empty of the tank

The configuration of the RLT series level meter is as shown in the following.
Radar lens sends the microwave and detects the target.
Transmitter sends the microwave and then it measures the time of flight that reflected the objects. It can be displayed on the LCD or sent its currents on the output terminal.

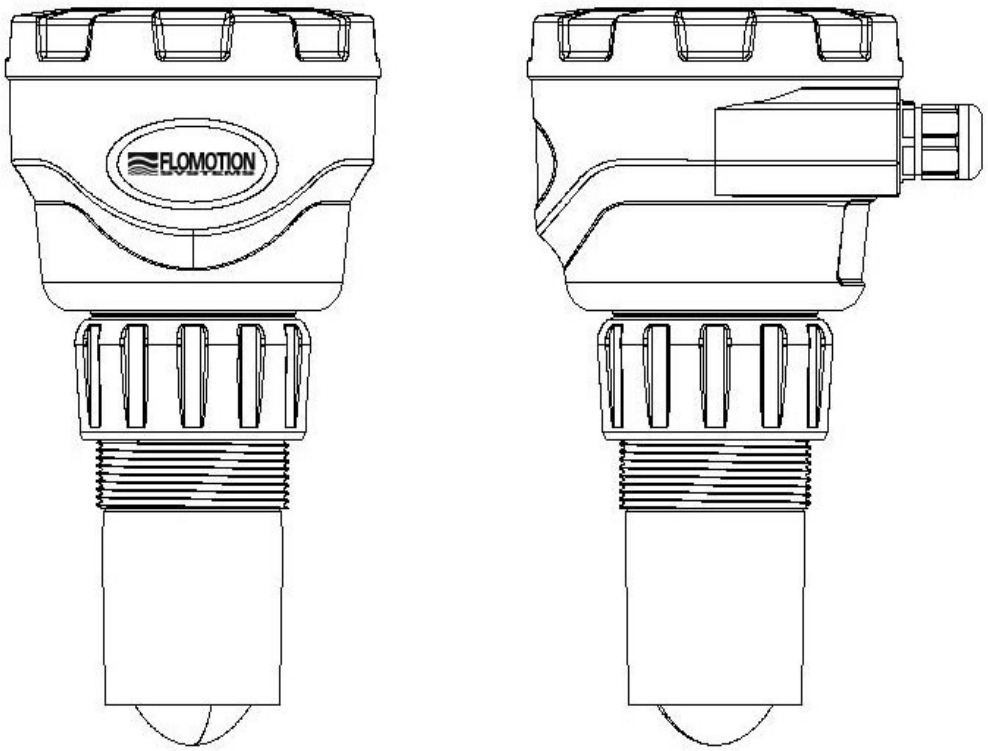


Figure 1.1 RLT50

	RLT50
Application	Liquid, Bulk solid, etc
Measuring Range	7.9" – 50 ft (0.2 - 15m)
Thread	2" NPT
Terminal type	2-wire looped powered
Material	PP(Body), PVDF(Radar)
Water proof	NEMA 6P (IP67)
Frequency	60 GHz
Signal output	DC 4 - 20 mA
Operating Temperature	-22 – 158F (-30 - 70°C)
Working Pressure	up to 36 psi (2.5 Bar)
Accuracy	±0.2" (±5mm)
Resolution	0.04" (1mm)
Power	Nominal 24V DC Max. 30V DC 4 to 20mA Max.550 Ω

Table 1.1 Specifications of RLT50

Chapter 2

Installation

warning

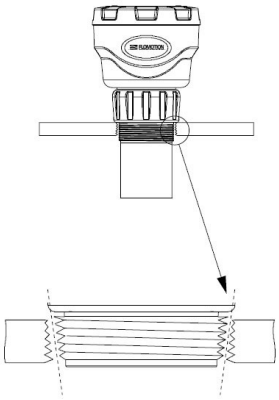
Refer to the specifications if the environment of installation is suitable before installing. Refer to chapter 1 for the specifications.
Please note the following during installation.

caution

(1) Remove any obstacles between the transducer and the target.
(2) Keep the level meter far away from an inside wall of tank or other obstacles so that it can measure correctly.
(3) Place the level meter far away from a device which has a strong electromagnetic wave.
(4) The surface of the lens should view the right angle with the target.
(5) The water level has to be higher than the blind level.
(6) It is good for the level meter to avoid direct sunlight or a strong wind.

2.1 How to install

RLT50 can be mounted with a mounting bracket or with screw in flange or in many other ways. This manual explains two typical mounting types of RLT50.



warning

If the equipment is installed or used in a manner not specified in this manual, then the protection provided by the equipment may be impaired. The thread specifications are as following.

Model	Thread
RLT50	2" NPT

2.1.1 Installation with mounting bracket

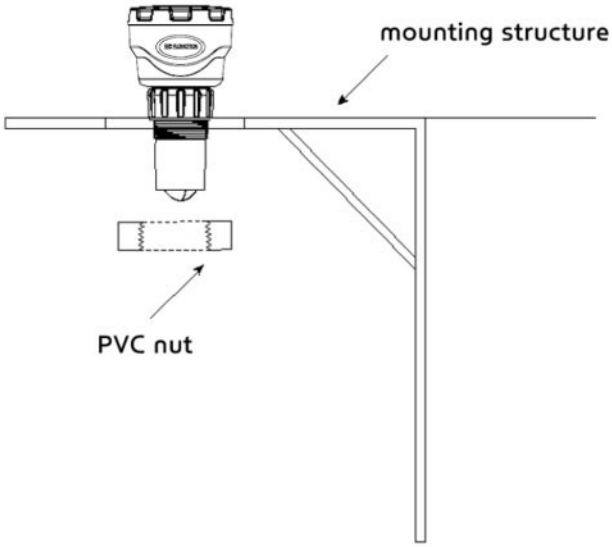


Figure 2.1 How to install with mounting bracket

note

Please contact us if you need PVC nut that is an extra component.

2.1.2 Installation with screw in a flange

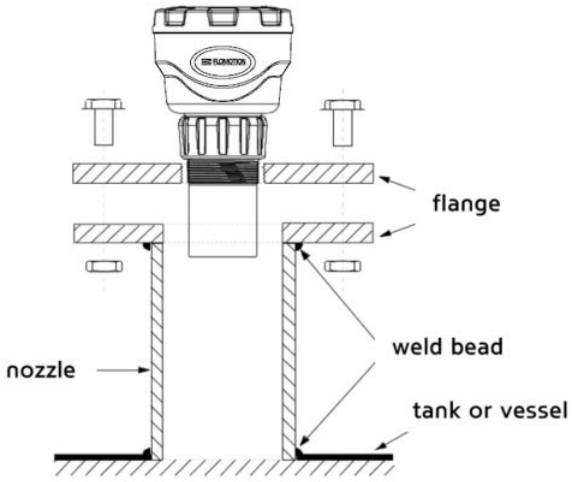
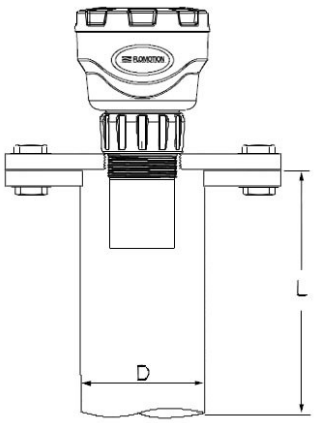


Figure 2.2 How to connect with screw in a flange



The nozzle length shouldn't be exceeded the maximum length above. Shorter setting is better. The recommended nozzle specification is as following.

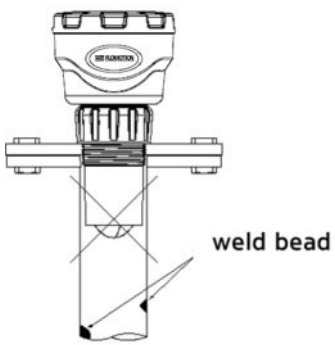
Table 2.1 Recommended Nozzle length (unit: in)

Inner diameter (D)	Length (L)
3	9
4	11.5
6	17
8	22.5

caution

The above table shows the maximum length based on the inner diameter of the nozzle, and the inner diameter and length do not necessarily have to be proportional. In other words, when the inner diameter is 3", it is better if the length is shorter than 9".

주 의



The nozzle should be free of obstructions such as weld seams..

If there is a seam or the internal weld cannot be removed, an extension pipe should be installed internally to eliminate the irregular reflection caused by the seam.

2.2 General cautions

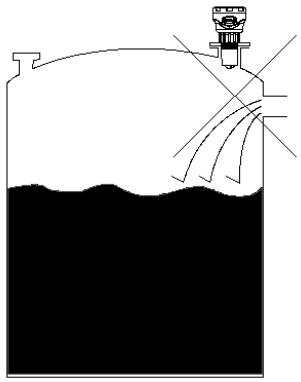
The general cautions are as follows during installation.

caution

(1) Remove any obstacles between the transducer and the target.
(2) Keep the level meter far away from an inside wall of tank or other obstacles so that it can measure correctly.
(3) Place the level meter far away from a device which has a strong electromagnetic wave.
(4) The surface of the lens should view the right angle with the target.
(5) The water level has to be higher than the blind level.
(6) It is good for the level meter to avoid direct sunlight or a strong wind.

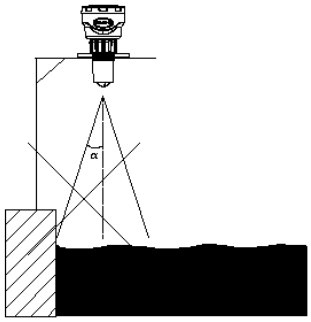
2.2.1 Avoidance of obstacles

Do not install the sensor near a filling flow outlet. Secure enough distance from the filling flow.

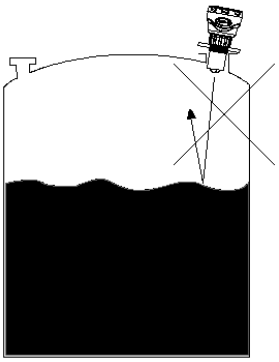


Do not install the sensor close to a device that has a strong electromagnetic wave such as a motor, or similar.

2.2.2 Keep enough distance for the radar path from the vessel wall.

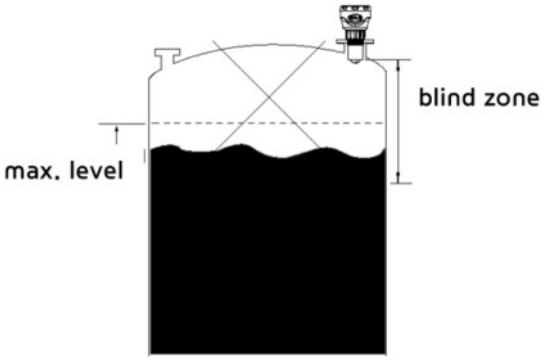


2.2.3 Installation of right angle



The level meter should be installed so that the target is perpendicular.

2.2.4 Secure enough space for the blind distance

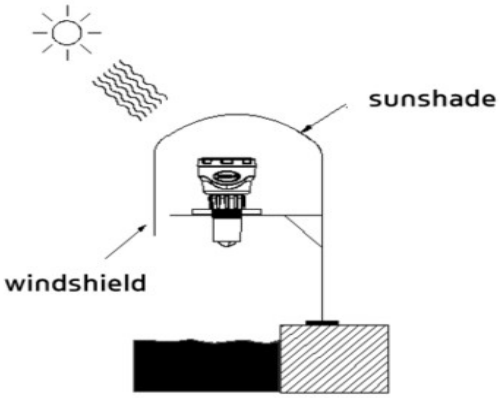


The maximum level should not be within the blind zone. If needed, you can install the sensor higher using a stand pipe. Refer to 2.3.4.

The blind zone means the range that the sensor cannot measure. The minimum blind distance is about 8".

2.3 Cautions in installation environments

2.3.1 When installed in an open space

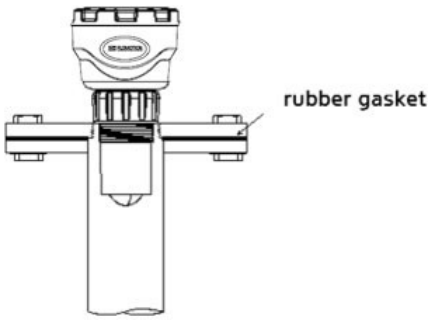


The level meter should not be installed in direct sunlight. Use a sunshade to protect the sensor.

In addition, it is good for the sensor to install with no strong winds due to vibration from the wind. Use a wind shield if needed.

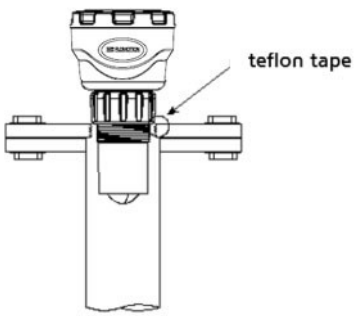
2.3.2 Severe vibration.

When installing in a place with severe vibration you should use rubber gaskets or vibration dampers to absorb the vibration and shock. Severe shock and vibration can trigger damage to the meter.

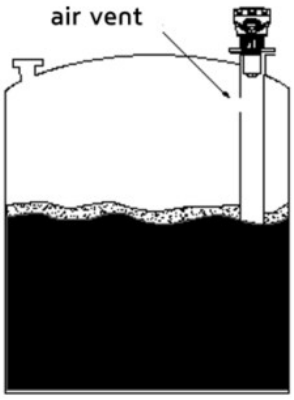


2.3.3 When the tank has to be sealed.

If the tank needs to be sealed, apply sealant to the threaded area or wrap Teflon tape.



2.3.4 When there is floating matter or foam.

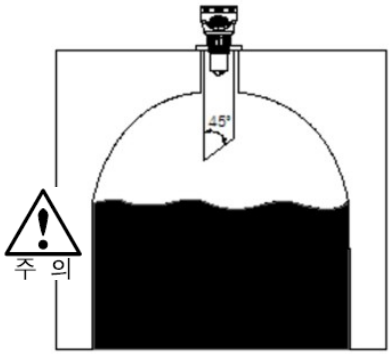


1. Prepare a pipe long enough to reach the floor. (recommend PVC)

2. Make a hole on top of the pipe to allow the water to move up and down the pipe.

- The pipe should be a single-piece without any joints.
- If you need to connect two or more pipes, there should be no protrusion or dents inside the pipes.

2.3.5 When there is an obstacle that cannot remove



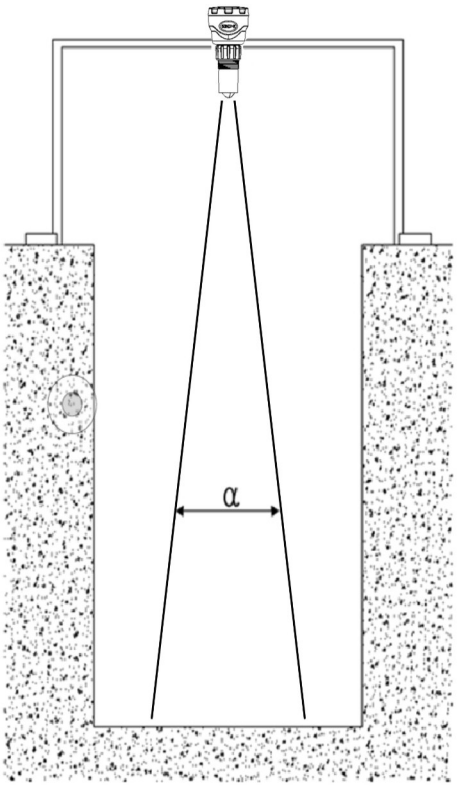
caution

1. Use a connecting pipe when there is an obstacle which cannot be removed. (recommend PVC)

2. Cut the end of pipe at a 45° angle

The pipe should be a single-piece without any joints.

Measurement distance (ft)	Beam Width (α) (ft)
3.3	0.6
6.6	1.0
9.8	1.5
13.1	1.9
16.4	2.4
19.7	2.9
23.0	3.3
26.2	3.8
29.5	4.2
32.8	4.7
36.1	5.2
39.4	5.6
42.7	6.1
45.9	6.5
49.2	7.0



Chapter 3

RLT50 programming

This chapter describes all of the menu options in the RLT50. Press the menu button to begin programming. Use the up and down keys to choose the desired menu.

3.1 Introduction of RLT50

3.1.1 Specifications

Measuring objects	Liquid /solid
Measuring range	7.8" ~ 50 ft
Blind range	7.8"
Beam angle	10°
Response rate	0.005 – 5.5 fps (0.1 - 100 m/min)
Accuracy	+/- 0.2" (5mm)
Resolution	0.04" (1mm)
Display	5 digits LCD
Signal output	DC 4 ~ 20mA (Max. load 550Ω)
Frequency	60 GHz
Water proof	NEMA 4x / IP67
Material	PP(body), PVDF(sensor)
Weight	Nominal 1.2 lb
Thread	2" NPT
Wiring	2-wire loop powered
Operating Temperature	-22 ~ 158°F
Working Pressure	Up to 36 psi
Power	Nominal 24V DC at Max.550 Ω Max. 30V DC 4 to 20mA

Table 3.1 RLT50 specifications

3.1.2 Dimension

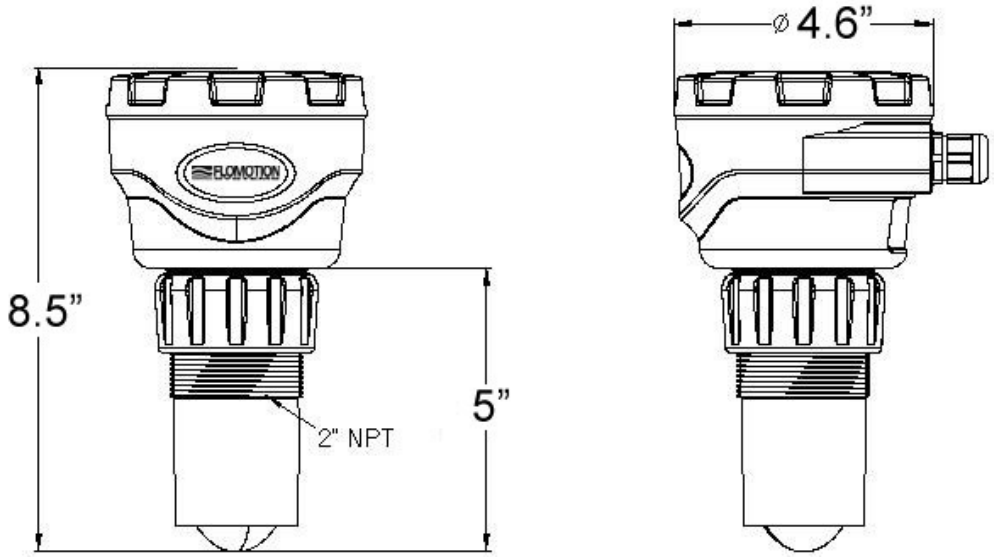
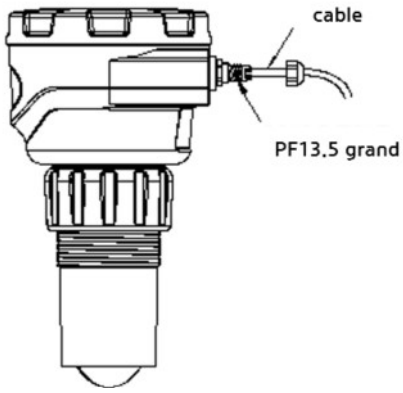


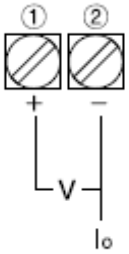
Table 3.1 RLT50 dimension

3.1.3 Wiring

RLT50 cable outlet does not prevent water from penetrating permanently. The wire should be bent downwards to connect to the RLT50 to prevent water from entering.

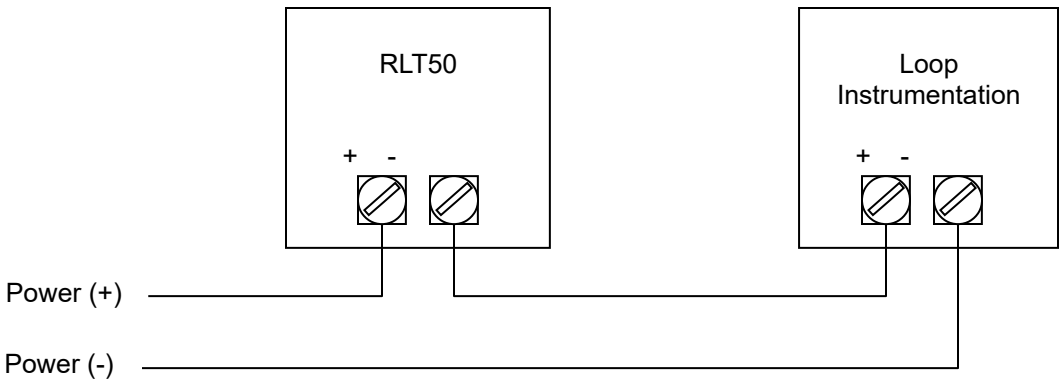


Insert the wire into the PG13.5 cable gland.

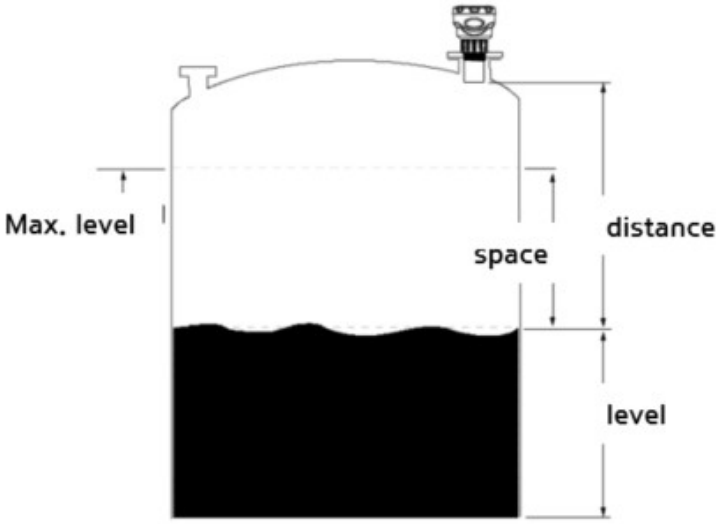


V: 20 - 30VDC power (Generally 24VDC).
I_O: Measurement value outputs as the current.

The RLT50 can be installed in a current loop with other instruments. **Maximum load of all instruments is 550 ohms.**



3.2 How to check after installing



After installing, the RLT50 starts with the initial value. The display shows the level value, which is the distance between the empty distance and the measuring surface of the water.

If not check if there is an obstacle in the way of the sensor beam.

The RLT50 shows normal when both status LED lights are on at the same time as the below table.

You can set each menu and then close the cover after finishing the programming.

Detect	Level
○	○

3.3 Control panel

The control panel consists of the LCD, status lights, and buttons. Refer to Chapter 3.5 for the status light functions.

Figure 3.2 RLT50 control panel

The LCD can show a number with 5-digits.
The distance unit can be set to meters or feet.

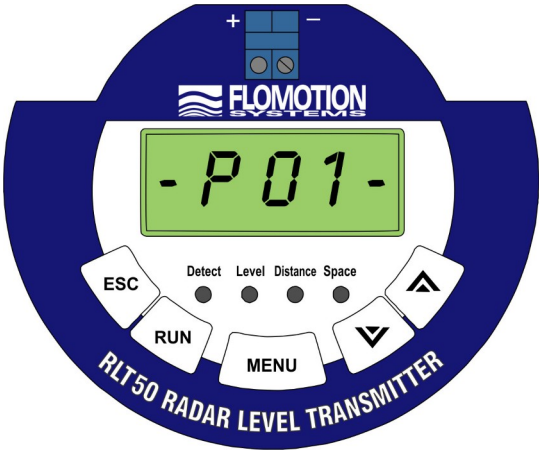
3.3.1 How to set the button

Press the MENU button to enter the setting menu. The moving of the menu is the circulation type. Press the RUN button when you finish a setting.

Start with Menu	MENU
Menu moving	UP / DOWN
Change setting	MENU
Changing setting	UP / DOWN
Changing digit position	MENU
Return menu	ESC
End of setting	RUN / ESC

How to display menu numbers

The MENU number is displayed after the letter P.



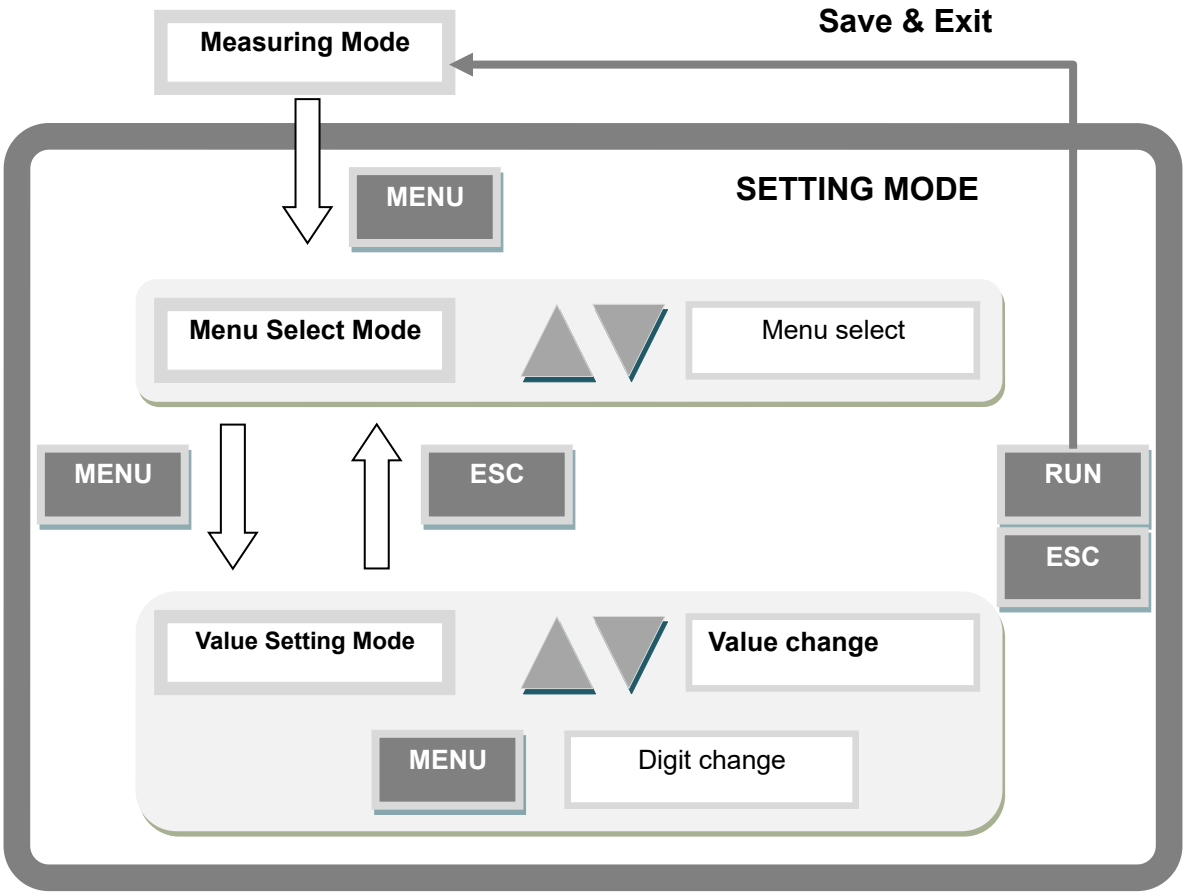
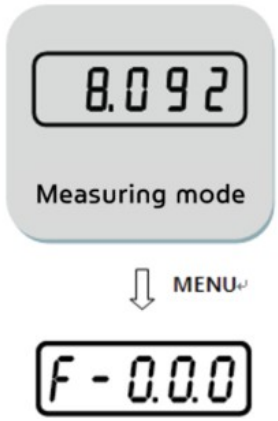


Figure 3.3 How to control button

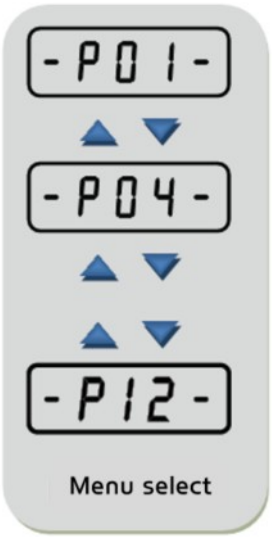
3.3.2 Example setting

To change the empty distance from 10ft to 9ft.



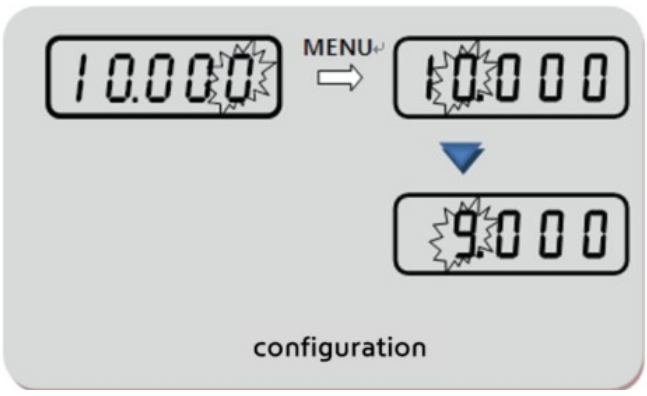
1. To change settings during measurement, press the MENU button.

2. The firmware version is displayed for about 2 seconds.
(P01 will be displayed automatically, after 2 seconds)



3. When the menu is displayed, use the UP or DOWN buttons to select the desired menu. (Select P04 to select the empty distance for example)

Please refer to the settings menu table for the settings menu numbers and settings functions.



4. When settings are displayed, the right most number is selected.

5. Use the MENU button to select the number you want to change.

6. After selecting the number of digits, use the UP or DOWN buttons to set the desired value.

7. After the settings are complete, press the RUN button to save the settings.

8. Press ESC button to go to the upper

menu.

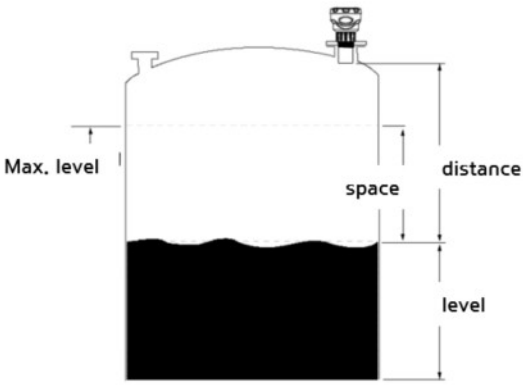
3.4 Settings menu

Type	Menu number	Function
General settings	P01	Measurement type
	P02	Unit type
	P03	Display type of measurement
	P04	Empty distance
	P05	Blind distance
Output settings	P06	4mA output point
	P07	20mA output point
	P08	Error output
	P09	Error keeping time
Detection settings	P10	Detection type
	P11	Object type
	P12	Damping rate

Table 3.2 RLT50 settings menu

3.4.1 General settings

[P01] measurement type



You can select the measuring type. The default is 1.

value	mean
0	Level
1	Distance
2	Space

Level: Distance from the empty to the water surface
Distance: Distance from the sensor to the water surface
Space: distance from the current water surface to the maximum water level

Figure 3.4 measurement type

[P02] Unit type

Value	Function
0	Meter
1	feet

You can choose the distance display unit of measure. The default is 0.

[P03] Display type of measurement

Value	Function
0	Distance
1	current (mA)
2	Percent (%)

You can select the display type of the measuring value. The default is 0.

Distance: The measurement value shows that it is converted to the unit selected in menu number [P02]

Current (mA): The measuring value displays as the 4-20mA current.

Percent (%): The measured value is converted and displayed as a percentage of the 4-20 mA set value.

[P04] empty distance

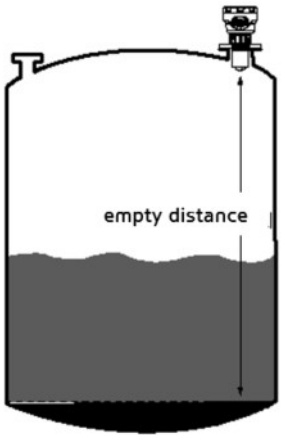


Figure 3.5 empty distance

Sets the distance between the transducer and the empty. The default is 16.4 feet (5 meters). It can be set up to 49.2 feet.

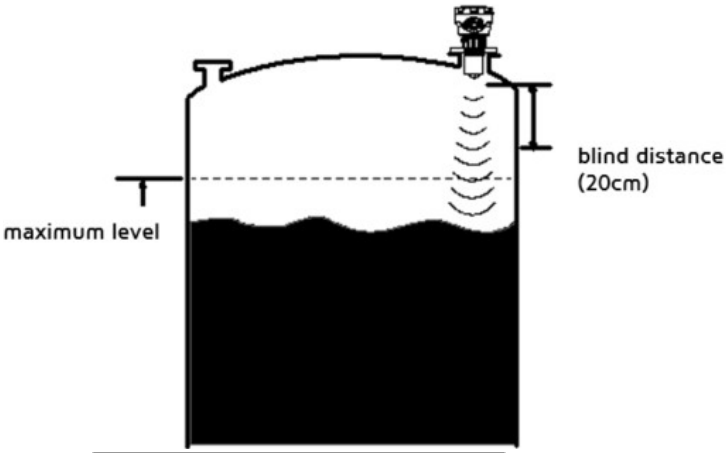
Model	default
RLT50	16.4 ft (5 m)

caution

If you set the menu number [P01] to height (Level) measurement, you have to enter the empty distance correctly to measure accurately. Therefore, we recommend to measure the current water level using another tool and then enter the floor distance as follows.

Empty distance = current water level + measuring distance

[P05] blind distance



Model	Value
RLT50	8 in. (20cm)

Figure 3.6 Blind distance

The blind distance is a distance that cannot be measured. The default is as the following.

3.4.2 Output settings

[P06] 4mA output point

The output range of the current is from 4 to 20mADC. You can set a point to output 4mA. If the 4mA output point is set as the lowest point, the 20mA output point should be the highest point. However, the opposite setting is also possible. The default is 0.

[P07] 20mA output point

model	value
RLT50	16.4 ft (5m)

The output range of the current is 4 to 20mA. You can set a point to output 20mA. If the 20mA output point is set as the highest point, the 4mA output point should be the lowest point. However, the opposite setting is also possible.
The initial value is the table on the left.

When changing the empty distance in menu number [P04], the 4mA / 20mA output points also need to be changed accordingly so that the current output matches the actual measured value.

[P08] error output

Value	Mean
0	3.8 mA
1	hold
2	22 mA

If the level meter is not properly installed, the transducer has failed, or the measurement environment changes, and it can't measure correctly the 4-20mA value will go to either 3.8mA or 22mA depending on your choice. The default is 22mA.

The hold value continues to output the current for the measurement value just before the error occurred. If the current of 3.8mA or 22mA is connected in a way that can directly affect the operation of another device, even though a fault occurs for the moment, that device may stop or malfunction. You should select the option 1 to avoid this problem.

[P09] error keeping time

Most errors are transient, so the level meter will continue to search until it returns to normal. However, if it does not return to normal after the time set here, it will be considered an error. The range of setting is about 20 - 900s, and the default is 1.

Value	Sec	Value	sec
0	20	5	500
1	100	6	600
2	200	7	700
3	300	8	800
4	400	9	900

3.4.3 Detection settings

[P10] detection type

Value	Mean
0	Closest
1	Strongest

The reflected signal depends on the target that can receive a strong or a weak signal. Or it can be received another signal that does not want because of obstacles. You can choose which signal is available. The initial value is 0.

Closest: It detects the first signal.
Strongest: It detects the strong signal

[P11] Object type

Value	Mean
0	Bulk solid
1	Liquid

The signal quality is dependent on the objects (liquid, foam or solid). You can select the object type that you want to measure. The default is 1.

[P12] Damping rate

Value	mean	
0	0.1 m/min	Slow
1	1 m/min	↑
2	10 m/min	↓
3	100 m/min	fast

The measurements are not displayed in real time, but displayed as an average for a period of time.
It helps to get much more accuracy. However, the accuracy could be reduced if the water level changes rapidly. For getting a correct value, it is good to select the damping rate to suit the
velocity of water level change. The default is 1.

3.5 Check the status

The indicators show the operating status of the RLT50. If an error occurs, all displays turn off and an error message appears on the display. If you are not able to resolve the issue with the solution for the error message, please contact us for service.

Indicator / Status	Detect	Level, Distance, Space
Normal operate	○	●
Searching echo		●
error		

○ blink ● lit

Searching echo

- When the water level changes rapidly all of a sudden
- When there is an obstacle into the radar wave path for the moment
- When the normal measurement is not possible due to electric noise.
- When the RLT50 turns on for the first time

The level meter starts to operate normally after a few seconds, if the above conditions release.

Error type

This condition happens during no echo signal or abnormal cases. It displays error current output and error messages on the LCD.

Error message	mean
E-Err	If there is no echo signal

If a system error occurs, the following error message will be displayed on the LCD.

Error message	mean
S-Err	If in the system or the sensor occurs the fault

See Chapter 4, if an error occurs.

Chapter 4 Troubleshooting

How to solve the problem

If you encounter any problems refer to this chapter to try to resolve the problem. If you cannot solve the problem using the manual alone, please contact us for service.

When you request service, please provide as much detailed information as possible about the installation environment and symptoms of the failure so that the problem can be resolved quickly.

Problem	Cause	Action
◆ No numbers are displayed on the LCD. ◆ No current outputs	Power is not supplied	1. Check the connection status of the terminal block and wires. 2. Check the input power (DC 20 - 30VDC) 3. Check the degree of submersion and corrosion of terminal blocks. If all of the above checks are normal, request service from us.
◆ All status indicators are off ◆ An error is output ◆ The E-Err shows on the LCD	It cannot detect reflected waves	1. Make sure the high water level is set lower than the empty distance 2. Check the empty distance 4. Make sure Detect lights up. If it does not blink, check the installation status and adjust the detection type 5. If there is an obstacle between the radar lens and the water surface, remove it. 6. If there is foreign matter on the sensor surface, remove it.

Problem	Cause	Action
◆ All status indicators are off ◆ The S-Err shows on the LCD	The transducer is defective	Request our service
◆ Continue printing out measurements for previous numbers.	The water level fluctuates severely or the surface of water is rough	Set the damping rate higher than the current setting
◆ The measured water level is higher than the actual water level. ◆ Outputs a fixed measurement value regardless of water level ◆ It works well at close range.	There is an obstacle above the water.	1. Remove obstacles. 2. If the obstacle is higher than the highest water level, set the blind distance as the distance just past the obstacle
◆ The measured water level is lower than the actual water level. ◆ Measurement is not accurate ◆ It seems to work only well at a distance.	There are a lot of reflect echoes so it is detecting another signal.	1. Set the blind distance again 2. Set the detection type again.
◆ S-Err appears on the display.	If the empty distance setting is smaller than the actual measured distance If the blind distance is bigger than the empty distance In case of radar sensor failure	Set the empty distance again Set the blind distance again Request service from us

Problem	Cause	Action
◆ The measured water level varies considerably and periodically.	Rotating bodies such as motors and generators are installed.	1. Set the damping rate lower than the current setting. 2. Move and install the level meter to a location where it will not be affected by the rotating body
◆ The measured water level changes irregularly.	An obstacle appears in the sensor path	1. Set the damping rate lower than the current setting. 2. Set the detection type again. 3. If there is any foreign matter on the sensor, remove it.
◆ The measurement value only displays the blind distance.	This problem is caused by a protrusion inside the nozzle.	1. Check the inner surface of the nozzle. 2. Make sure the nozzle size meets the minimum recommended specifications. 3. Increase the blind distance within a range that is satisfactory with the highest water level.
◆ If the sensor is a closed space, measurements have error ratio.	The pressure raised for being occurring the gas	1. Install a ventilation fan.

If you are having trouble connecting to an external device

note

Problem	Cause	Action
◆ The level meter display does not match the external device display.	The setting range of output current is different each other	Check the 4mA/20mA output points and match the settings of both devices.

Flomotion Systems, Inc.
3 N. Main St, Middleport, NY 14105
Toll Free: (800)909-3569 (U.S. & Canada)
Tel: (716)691-3941
Fax: (716)691-1253
info@flomotionsystems.com
www.flomotionsystems.com
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