RLM7000
RADAR LEVEL METER
User's Manual



July 2026

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Introduction

This manual provides important information regarding the installation, wiring, operation, and use of the RLM7000 and its dedicated sensor. Please make sure to thoroughly review this manual before installing or operating the product. Additionally, as this manual is crucial for operating the product, take care to store it properly.

- This manual is provided in an electronic document version along with the product at the time of purchase. Additionally, it can be downloaded at any time from the company's official website.
- The contents of this manual are subject to change without prior notice if the product is modified or improved for functional enhancements. Please take this into consideration.
- This manual is regularly reviewed and updated, but errors may still be present. If you discover any errors, please contact our service center at any time. We will reflect your feedback in the next version

1. Safety Guidelines

01 User	The installation and operation of the product must be carried out by certified professionals or individuals with equivalent qualifications. Always wear appropriate safety protective equipment when handling the product.
02 Operation	The manufacturer assumes no responsibility for accidents resulting from failure to follow the installation instructions outlined in the manual, unauthorized modifications to the product, or user errors. For optimal performance and safety, ensure regular maintenance and periodic inspections of the product.
03 Precautions	Please adhere to the safety precautions outlined in the manual. The manufacturer assumes no responsibility for accidents or risks that may occur if these precautions are not followed.
04 Product	After opening the product box, carefully check for any damage or contamination of the product and its accessories. A damaged product may not function properly.

Manual Icons

Icon	Description
	Failure to comply with the safety precautions may result in the device not functioning properly.
	Failure to comply with the warning instructions may result in personal injury or damage to the device.
	There is a risk of electric shock due to high voltage, so please exercise caution during wiring work.
	It provides additional information

2. Product Description

The RLM7000 is a non-contact radar level sensor that can support up to two connected sensors. Depending on the sensor used, the measurement range can be up to 15 meters or 30 meters. The RLM7000 is designed with a user-centered approach, making it easy to operate and requiring minimal installation time. Additionally, it is designed for easy maintenance, which helps reduce management costs.
The product's quality, optimized for various field environments, ensures reliable level measurements and smooth processes, making it an ideal choice for applications requiring precise and consistent level data.

Operating Environment	· Water Treatment Plants, Wastewater Treatment Plants, and other Water Facilities · Tanks for Storing Water, Liquids, and Chemicals · Rivers, Canals, and Other Waterways

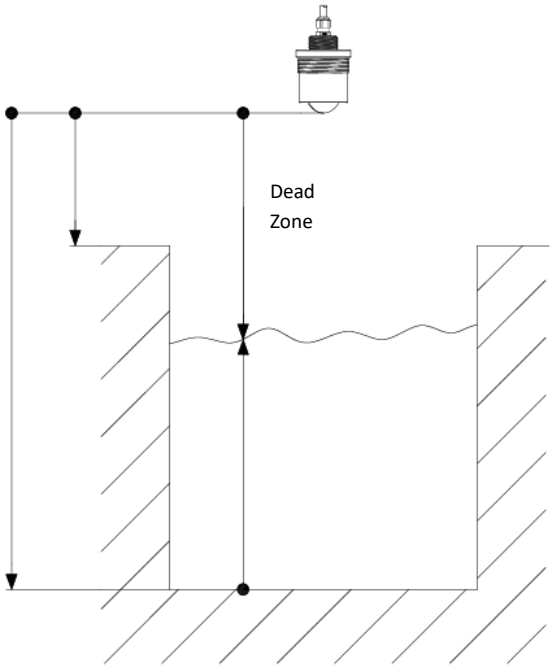


- **The ultrasonic sensors LXD-05, LXD-10, and LXD-15 are not compatible with the RLM7000 controller and will not function properly when connected.**
- **The measurement range may be limited depending on the material properties of the installed sensor. When measuring chemicals, be sure to consult with the supplier or sales representative to ensure compatibility and optimal performance.**

2.1 Measurement Principal

The RLM7000 measures the level or volume by detecting the time it takes for a radar pulse, emitted from the radar sensor, to reflect off the surface of the material and return. This time is then converted into a distance, which is used to calculate the level or volume of the material.

Distance = (Time of Flight x Radar velocity)/2
Radar velocity = Approximately $3x10^8$ m/s



Dead Zone: The non-detectable area where the sensor cannot measure.

Distance: The distance from the sensor to the surface of the material being measured.

Level: The distance from the bottom (or base) to the surface of the material.

Empty: The distance from the sensor to the bottom (or base).

2.2 Specifications

Controller

Empty **Measurement**		Non-contact Radar Pulse Reflection Method
Precision		0.02% of F.S
Resolution		0.04in. (1mm)
Response time		0.1mm/min ~100m/min (Options)
Output	**Analog**	4~20mA into max 750Ω
	Relay	3 or 6 (optional)
	Digital	RS-232(485), Modbus
Display		Graphic LCD
Protection		IP65
Operating Temperature		-4F to 140F (-20℃~ 60℃) Maximum Humidity 80%

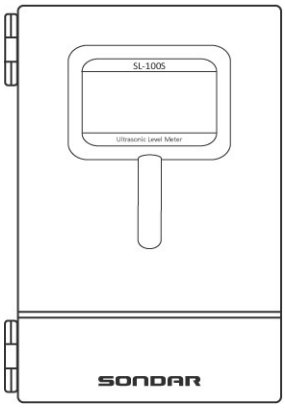
Material	Polycarbonate
Size	6.54(W) X 9.8(H) X 3.7(D)in. (166(W)X250(H)X95(D)mm)
Weight	4.4 lb. (2kg)
Power	100-230V AC±15%, 50/60Hz, 29VA(12W) Fuse: 250V T1.0A
Location	Indoor/Outdoor
Altitude	6561 ft (2000m) max
Installation Category	Ⅱ
Pollution	Degree 4

Sensor

Measurement range	0.6–50ft (0.2-15m)
Frequency	60GHz
Beam angle	10° at -3dB
Mounting Specifications	1-inch & 2-inch NPT
Weight	3.3 lbs (1.5kg)
Material	PVDF, PP
Operating Temperature	-22 ~ 158F (-30°C ~ 70°C) Maximum Humidity 90%
Protection	IP68
Cable	3-Core Shielded Cable (AWG20, Extension Capability: Up to 984ft (300m)
Certification	FCC, CE, UL

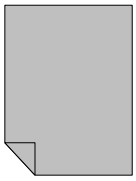
2.3 Product Components

The RLM7000 measures the level by combining with the SR50 radar level sensor, which is specifically designed for level measurement. The controller and the sensor are packaged separately. The components of the RLM7000 are as follows:



Controller body


Cable Gland X3
(PG13.5 1EA)
(PG11.0 2EA)

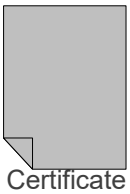

Certificate

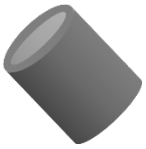

USB Connector (option)

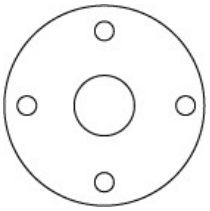
> **Caution** **The RLM7000 controller complies with the IP65 waterproof rating standard. To facilitate installation, the controller is shipped with 5 gland holes on the bottom surface and 3 cable glands pre-attached.**

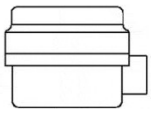
The SR50 radar level sensor consists of the following components:


Radar Sensor
(SR50)
(Cable length: 10m)


Certificate


1" adaptor (option)


Flange (option)


Head (option)

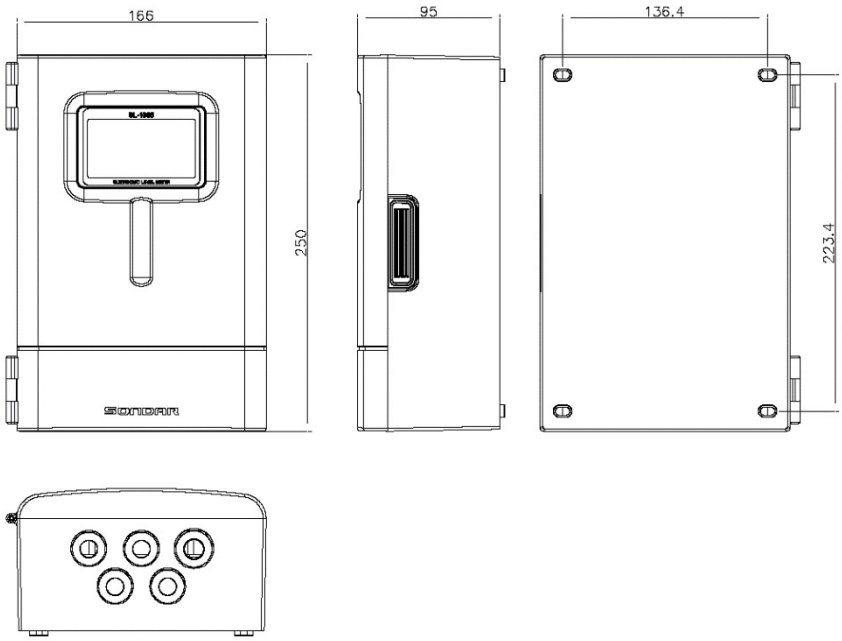

Pipe (option)

* The cable length may vary depending on the option selected

2.4 Product Appearance

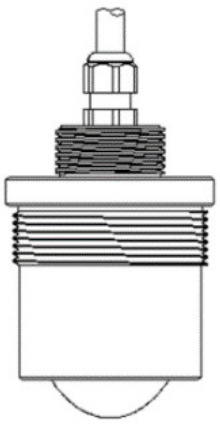
2.4.1 Controller

The RLM7000 controller is made of polycarbonate material and has an IP65 waterproof rating. The diagram below shows the product's external dimensions, and the controller can be installed in a wall-mounted configuration using the mounting holes on the back of the case.



2.4.2 Sensor

The SR50 series radar sensors are dedicated sensors used in conjunction with the RLM7000 controller. The sensors are designed to be securely fixed using the threaded coupling at the top of the sensor, allowing for attachment to a PVC socket of the appropriate size or direct mounting onto a flange.



SR50 for 50ft (15m)

3. Installation

3.1 Precautions During Installation and Commissioning



Before installing the product, please refer to the manual and specifications to ensure that the product is suitable for the installation environment.

Failure to do so may result in the product not functioning correctly.

The following content outlines general precautions to consider when installing radar measurement devices. These guidelines apply to all products from Flomotion Systems.

- Remove any obstacles between the sensor and the measured material.
- Ensure there is sufficient distance between the radar and the tank's inner wall or other structures to avoid interference.
- Install the radar sensor so that the sensor surface is perpendicular to the measured material.
- Make sure that the maximum water level does not fall within the dead zone.
- Avoid exposure to strong winds and excessive direct sunlight. Strong winds can alter the radar's path and cause malfunction. If installation in direct sunlight is necessary, install a shade.
- Keep the sensor away from areas with strong electromagnetic noise, such as high-voltage or high-current environments.
- Do not install the sensor in locations with excessive vibration.



After installing the product following the instructions in the manual, please verify that the product is operating correctly by using the [130] Current Simulation menu and the [237] Relay Simulation menu.

3.2 Controller Installation

(1) Location Selection

Please install the RLM7000 controller in a location that meets the following conditions:

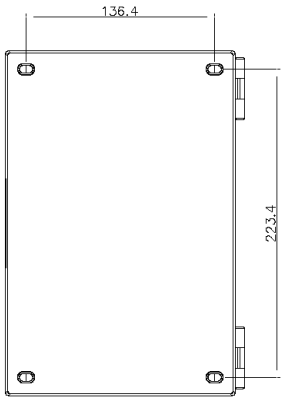
- A location where the temperature can be maintained within the range of -20 to +60°C.
- A location where the cable length to the radar sensor can be minimized.
- A location that allows for easy verification of the product's commissioning and operational status.
- A location that is protected from direct sunlight.
- A location free from vibration.
- A location with sufficient space around the controller to ensure proper clearance when the controller cover is opened.

Electric shock

Please avoid installing the controller in locations where high voltage or high power is present, or near motors or controllers. These areas may cause interference or affect the performance of the RLM7000 controller.

(2) Installation Method

The installation sequence is as follows:



Open the cover of the controller and locate the four holes along the edges for mounting.

Drill four base holes (3.5mm in diameter) on the wall where the controller will be installed. (Refer to the dimensions in the diagram.)

Position the controller on the wall, aligning the holes in the controller with the base holes you just drilled.

Use four screws to securely fasten the controller to the wall.

Info

For wiring information regarding the controller terminal block, please refer to page 22 of the manual.

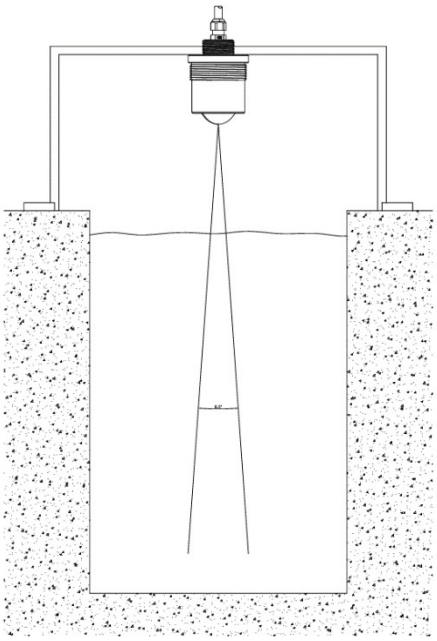
3.3 Sensor Installation

(1) Location Selection

Please install the SR50 radar sensor in a location that meets the following conditions:

- **A location with a surrounding temperature range of -22~158F (-30 to +70°C)**
- **A pressure tank within the range of 13 to 30psi (0.9 to 2 bar)**
- **A location protected from direct sunlight.**

(2) Installation Method



The detection range of the radar sensor is determined by the intensity of the sound pressure generated by the radar, which is closely related to the sensor's directivity. Typically, the sound pressure generated by the radar sensor is strongest at the center and decreases as the angle increases. The detection range is generally set to the point where the sound pressure drops by -3dB relative to the center axis, which is typically around 10°.

The dead zone of the SR50 level sensor used with the RLM7000 is 20 cm. The dead zone is an area that the radar cannot detect due to the radar's characteristics. When installing the sensor, this should be taken into consideration.

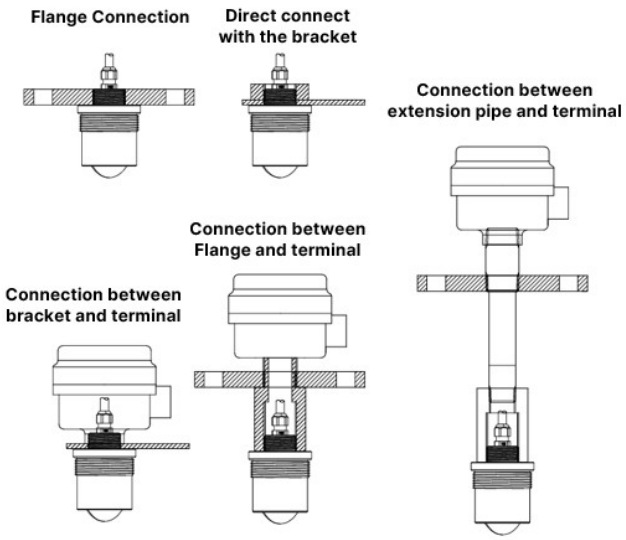
Info

In installation environments where signal attenuation occurs due to the installation location, measurement distance, or the material being measured, additional adjustments or settings may be required.

When installing the radar sensor, ensure that there are no obstacles within the radar beam angle range, as shown in the diagram. Any obstacles in the radar's path can interfere with the radar's operation and affect its performance.

Measurement Range (ft)	Measurement Range (m)		Separation Distance (ft)	Separation Distance (m)
3.3	1m		0.3	0.08
6.6	2m		0.6	0.17
9.8	3m		0.9	0.26
13.1	4m		1.1	0.35
16.4	5m		1.4	0.44
19.7	6m		1.7	0.52
23.0	7m		2.0	0.61
26.2	8m		2.3	0.70
29.5	9m		2.6	0.79
32.8	10m		2.9	0.87
36.1	11m		3.1	0.96
39.4	12m		3.4	1.05
42.7	13m		3.7	1.14
45.9	14m		4.0	1.22
49.2	15m		4.3	1.31

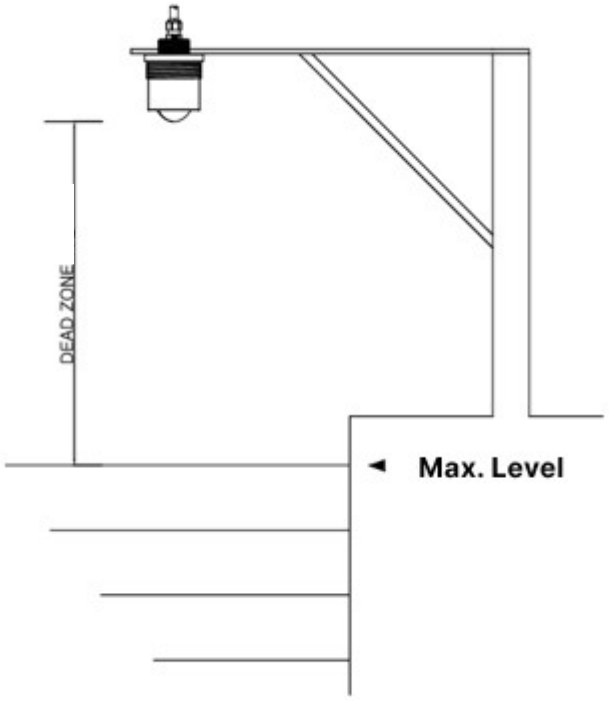
Additionally, the radar sensor can be installed in various configurations, such as using a flange, sensor adapter, connection terminal, or metal pipe, as shown in the figure below. These components can be purchased separately from our company



3.4 Precautions for Installation Sites

3.4.1 Installation in an Open Areas

When installing in open areas (such as waterways), install a mounting bracket as shown in the figure below. Secure the sensor to the end of the bracket using a socket (1" or 2" PF) that meets the specified standards.



① Please refer to the precautions for installation and commissioning. (See page 14)

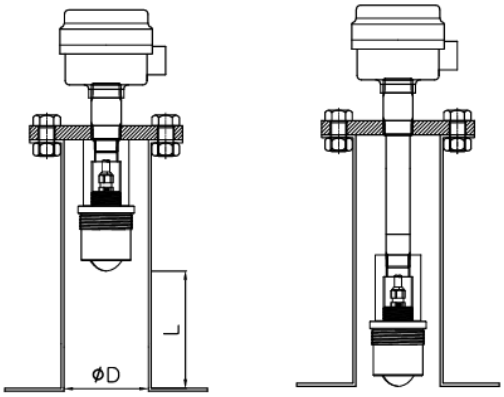
② Avoid locations where strong winds are present. Strong winds can alter the radar's path, potentially causing malfunctions

③ The shape of the mounting bracket can be modified depending on the installation location and surrounding conditions. For more details, please contact our company.

3.4.2 Installation in a Sealed Tank

① Please refer to the precautions for installation and commissioning. (See page 14.)

② When installing in enclosed spaces such as silos or tanks, install a flange that matches the required specifications as shown in the figure below. The diameter of the single pipe for sensor installation should be made according to the specifications in the table below. If the length of the pipe exceeds the maximum length, extend the installation of the sensor using an adapter and pipe, as shown in the right figure below.



ØD[in.]	ØD[mm]		Max. Length L [in.]	Max. Length L [mm]
3.1	80		7.1	180
3.9	100		9.1	230
5.9	150		13.8	350
7.9	200		18.5	470

③ To maintain air-tightness inside the tank, use a rubber gasket or similar material at the contact area between the bottom surface of the flange and the tank to seal it. The radar sensor should be sealed with silicone adhesive or welded to ensure air-tightness. (PVC flanges are available as an option.)

④ Installation is not recommended in areas with severe vibrations. If installation in tanks or locations with significant vibrations is unavoidable, use a rubber gasket between the tank flange and the PVC flange to block the transmission of vibrations to the radar sensor.

⑤ For protection of the sensor cable, the use of a flexible conduit is recommended. The junction box provided by our company supports the 1" PF standard. Connect the flexible conduit to the junction box.

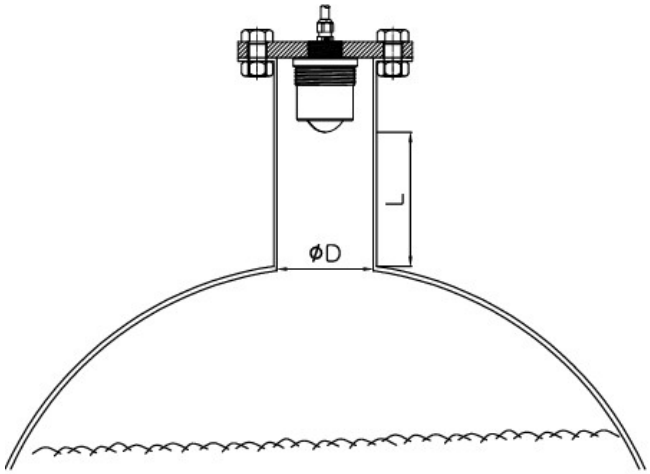
⑥ The shape of the mounting bracket can be modified depending on the installation location and surrounding conditions. For further details, please contact us.

※Incorrect Installation

- The measured level is higher than the minimum dead zone.
- There is welding slag inside the pipe.
- The pipe size does not meet the standard

3.4.3 Measuring the water level inside groundwater pipes

When measuring the water level of a thin-walled pipe inside a groundwater pipeline, extra caution is required as the internal space is smaller and the distance is shorter compared to a sealed tank. The installation method is shown in the figure below, and the dimensions of the single pipe follow the same specifications as those for a sealed tank



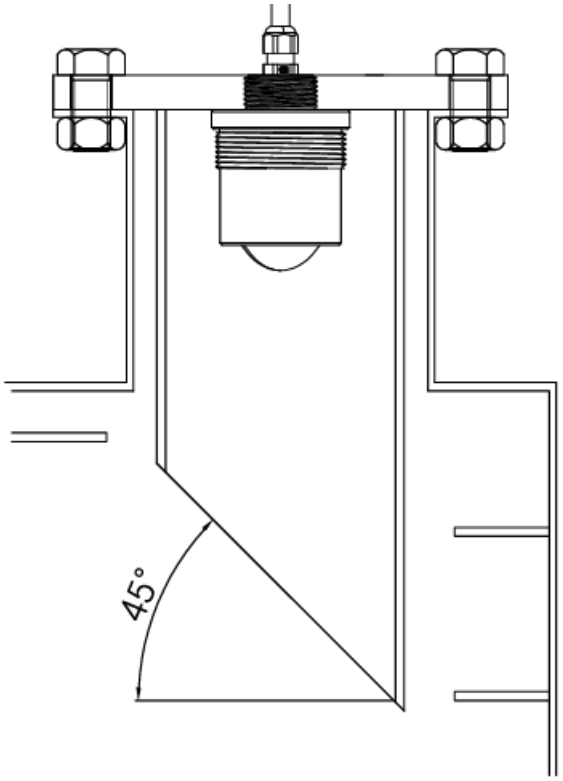
ØD[in.]	ØD[mm]		Max. Length L [in.]	Max. Length L [mm]
3.1	80		7.1	180
3.9	100		9.1	230
5.9	150		13.8	350
7.9	200		18.5	470

① It is preferable to use a single pipe that is not connected, and if an extension is necessary, ensure that the inner diameter at the joint is smooth without any protrusions or indentations when connecting the pipes.

② When measuring wastewater or similar substances, it is essential to regularly remove any accumulated contaminants inside the pipe.

3.4.4 When applied to storage tanks or silos with complex structures

If the structure of the storage tank is highly complex and measurement is not possible with the standard installation method, PVC pipes or similar materials can be cut at a 45-degree angle and installed in a straight line. However, in this case, the maximum measurement distance may be shorter than the standard, and the dead zone should be set differently according to the length of the pipe. Please verify before use



① The inner diameter of the pipe should provide enough space for the sensor to fit. While measurement within the maximum detection range is possible, it is recommended to use a pipe with a larger diameter for optimal performance.

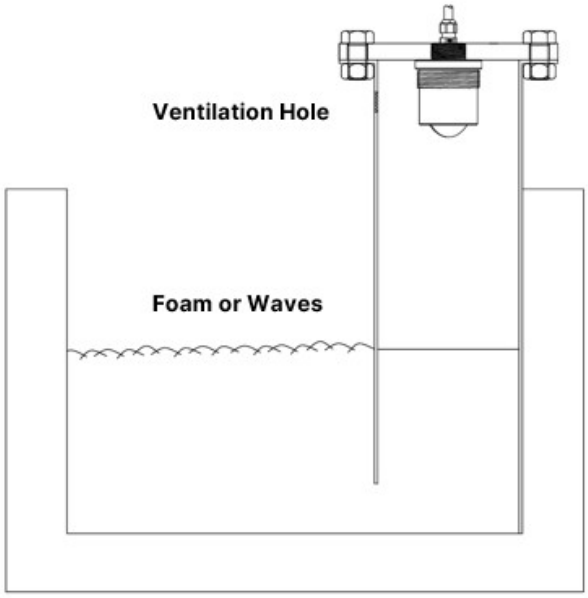
② The extension pipe connected to the sensor should be welded to a flange or similar fitting, and the opposite end should be cut at a 45° angle.

③ The length of the pipe should be extended to a distance where it can avoid obstacles in the direction of measurement. Please verify whether measurement at the maximum level is possible before making a decision.

④ It is preferable to use a single, unconnected pipe, and if an extension is necessary, ensure that no protrusions or indentations form on the inner side of the joint when connecting the pipes.

3.4.5 When measuring the level of foamy liquids

In areas with excessive foam or strong waves, measurement may be difficult. Therefore, install a vertical pipe to prevent foam from forming inside, and then perform the measurement.



① The pipe connected to the sensor should be welded to a flange or similar fitting, with a vent installed. The liquid inlet hole should be placed at the bottom. In this case, the maximum distance is set at the point where the pipe ends.

② A single unconnected pipe should be used. If an extension is necessary, ensure that no protrusions or indentations form in the inner diameter at the joint.

③ When measuring wastewater or similar substances, it is essential to regularly remove any suspended particles or debris inside the pipe to prevent them from adhering to the pipe's interior.

④ Particular care should be taken to prevent foam from entering the pipe.

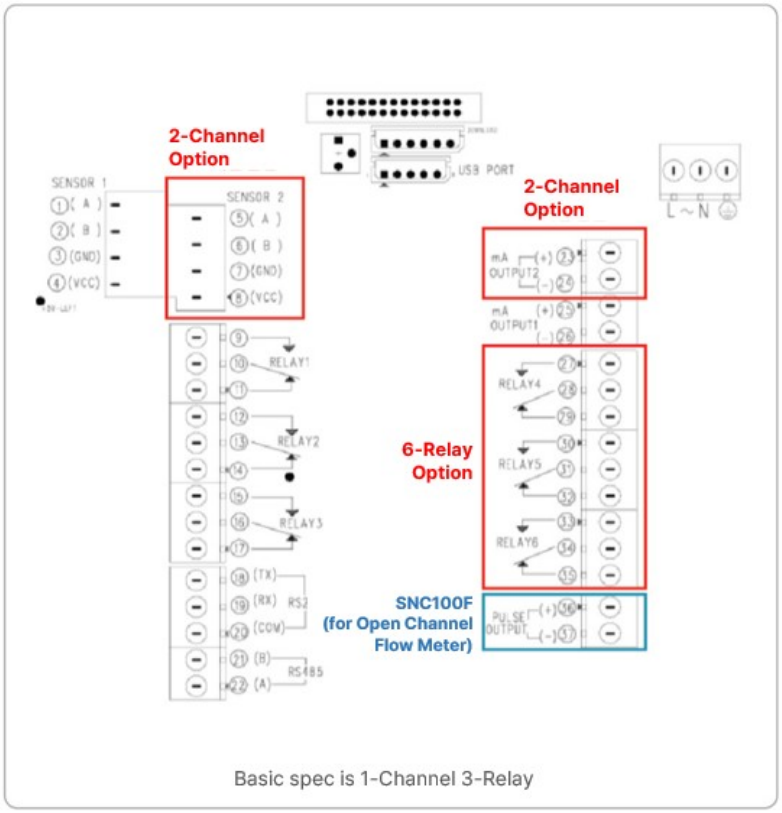
⑤ In enclosed spaces, it is necessary to adjust the intensity of the emitted radar compared to standard environments. For settings related to this environment, please refer to the TX POWER and RX GAIN menu descriptions on page 41.

4. Wiring

4.1 Wiring Information

4.1.1 Terminal Block

When you open the cover of the controller, the terminal block is arranged in a straight line as shown in the figure below.



Basic spec is 1-Channel 3-Relay

4.1.2 Wiring Method

Loosen the screw on the top of the terminal block using a 3mm (-) flathead screwdriver. Insert the cable's connected lug deeply and then tighten it by turning clockwise. Be careful not to apply excessive force, as it may damage the terminal block. The ground terminal must be connected to the power ground wire. For cable extensions on-site, it is recommended to use a 3-core shielded cable with an AWG 20 or higher specification.

Electric shock

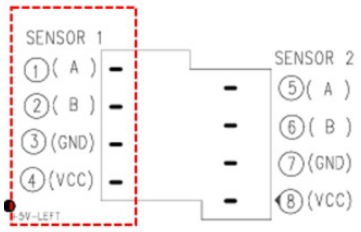
During wiring work, the power supply must be turned off.

Info

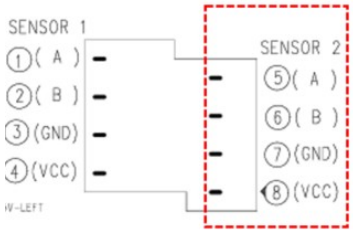
The terminal block may vary depending on the customer's options.

---

(1) Sensor



When selecting sensor channel 1 on the RLM7000, the SENSOR2 terminal on the terminal block cannot be used. After stripping the insulation from the provided sensor cable, connect the three cores and shield of the sensor cable to the terminal block according to the color markings.
When inserting the sensor cable's lug into the terminal block and tightening the bolt, please be careful not to apply excessive force.



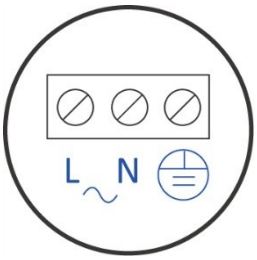
When selecting sensor channel 2 on the RLM7000, both the SENSOR1 and SENSOR2 terminals can be used. After stripping the insulation from the provided sensor cable, connect the three cores and shield of the sensor cable to the terminal block according to the color markings.
When inserting the sensor cable's lug into the terminal block and tightening the bolt, please be careful not to apply excessive force.



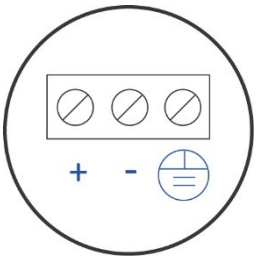
To avoid interference signals, the sensor cable should not be installed parallel to high-voltage lines or power supply lines, nor should it be installed near inverters.

(2) Power

The RLM7000's standard specification includes an AC power terminal, with the option to choose a DC power terminal. The wire gauge should be at least 0.75 SQmm



AC Power Terminal



DC Power Terminal



When installing the product for the first time, temporarily stop any related alarm or warning systems. Once the commissioning is complete and the device's proper operation is confirmed, re-enable the alarm and warning systems.

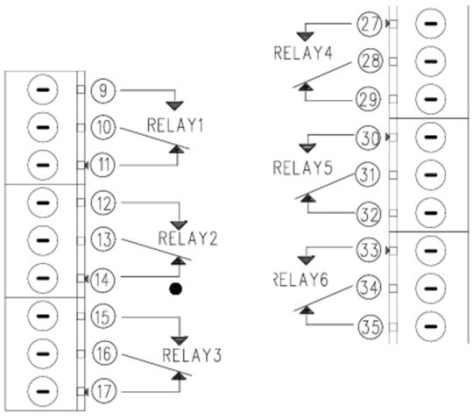


The RLM7000 has an internal fuse for overcurrent protection. When connecting AC power, install a 10A circuit breaker for device protection. The breaker switch should be located near the device for easy access in case of emergency.

(3) Relay

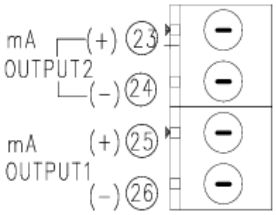
The relays provided by the RLM7000 are of the TWO FORM C type, and can be connected in either NO (Normally Open) or NC (Normally Closed) configurations. By default, 3 relays are provided, and 6 relays can be used as an option

- Two Form C, NO or NC relays
- 4A at 250Vac



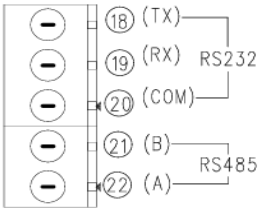
(4) Analog Output

mA OUTPUT1 is the analog output terminal for the signal from Sensor 1. mA OUTPUT2 is the analog output terminal for the signal from Sensor 2. For products with the sensor channel set to 1, the mA OUTPUT2 terminal cannot be used.



(5) Digital Output

This is the terminal for digital output. The default specification is RS232, and the output method can be changed through the selection options.



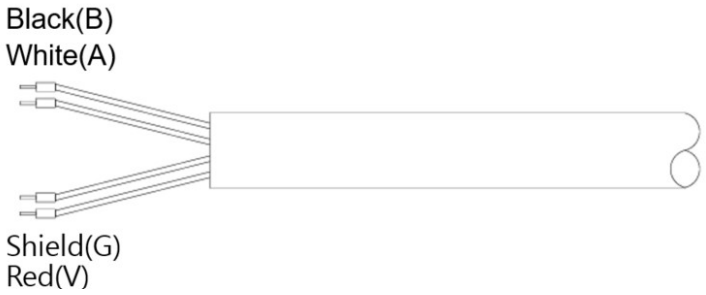
4.2 Sensor Cable

The RL series radar sensors use a 3-core shielded cable. A 10-meter length of cable is provided with the sensor upon shipment, and extensions can be ordered as an option if a longer cable length is required.

It is recommended to use the provided length as is. If cutting is necessary, minimize the stripping of the shield and securely connect the lugs. If an extension is required due to insufficient cable length, use the same type of cable, ensuring the shield connection is properly maintained with metal mesh or metal tape, and cover it with insulating tape. Additionally, waterproofing may be required to prevent rainwater from entering the cable.

The cable length can be extended up to 300 meters, although sensitivity may slightly decrease depending on the length. When working with sensor cables, ensure to use grounded conductive pipes and terminal blocks.

If the order specification includes the default 10m cable, it will be shipped without the end treatment. When extending the cable on-site, it is recommended to use a 3-core shielded cable with an AWG 20 or higher specification.



If a cable with a specification higher than the standard is ordered, a cable of the ordered length with pre-inserted lugs at the ends will be provided. The inserted lugs are only applied to extension cables.

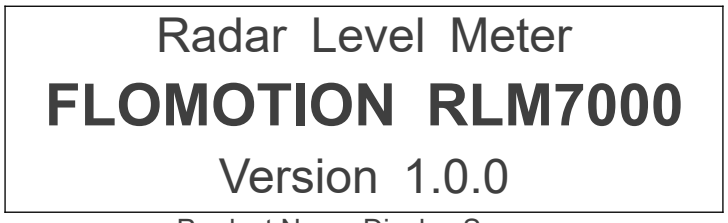


- **The use of coaxial cables or non-standard cables is prohibited. Our company is not responsible for any issues or malfunctions caused by using non-standard cables for extension work, so please be aware of this. To prevent noise interference, the sensor cable should not be installed parallel to high-voltage lines or power supply lines. Additionally, the sensor cable should not be installed near inverters**

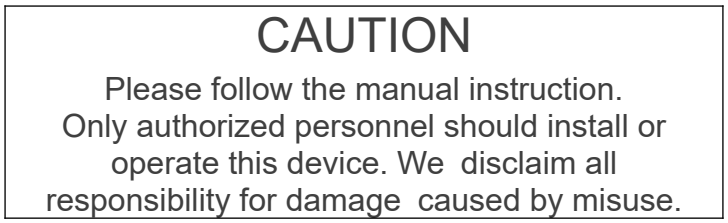
5. Operation

5.1 Initial Screen

When power is supplied, the product name display screen and warning screen will appear as shown below.



Product Name Display Screen



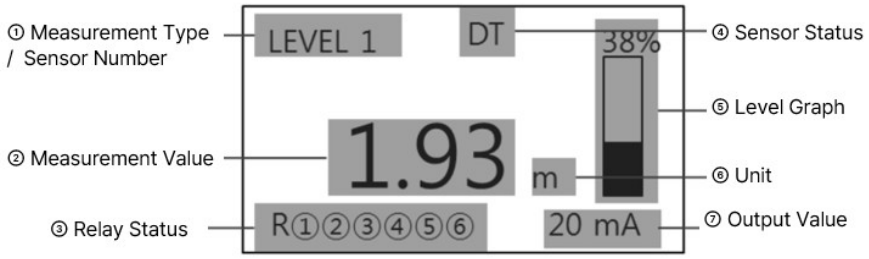
Caution screen

5.2 Display

5.2.1 Measurement Screen Mode

There are four types of measurement screen modes: Screen A, Screen B, Screen C, and Echo Trend. Pressing the [Up/Down] direction buttons will sequentially switch between the four screens. If only Sensor Channel 1 is connected, Screen B and Screen C will not appear

(1) Screen A



① The current measurement area type is displayed along with the operating sensor number. The displayed items are as follows:

LEVEL 1	Measuring the water level height. The number displayed indicates the operating sensor's number.
LEVEL 2	Measuring the water level height. The number displayed indicates the operating sensor's number.
DISTANCE 1	Measuring the distance. The number displayed indicates the operating sensor's number.
DISTANCE 2	Measuring the distance. The number displayed indicates the operating sensor's number.
SPACE 1	Measuring the spatial value. The number displayed indicates the operating sensor's number.
SPACE 2	Measuring the spatial value. The number displayed indicates the operating sensor's number.
VOLUME 1	Measuring the volume. The number displayed indicates the operating sensor's number.
VOLUME 2	Measuring the volume. The number displayed indicates the operating sensor's number.

② Displays the measured values for Level, Distance, Space, Volume, and other parameters.

③ It will be displayed on the screen only when the relay is in the ON state.

④ It indicates the sensor status, and the following items will be displayed according to the situation:

DT	LE
When operating normally	Lost Echo. When there is no sensor signal

⑤ The current LEVEL, DISTANCE, SPACE, and VOLUME being measured are converted into percentages and displayed as a graph.

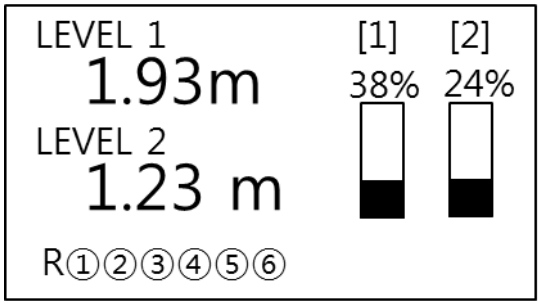
⑥ The unit of the currently measured value is displayed, and the available units are mm, cm, m, in, yd, and ft. When measuring VOLUME, the units mm, cm, and m are automatically converted to m^3, while the units in, yd, and ft are converted to gallons for display.

Info

In the [470] DISPLAY TYPE menu, you can select the display function for current output. (See page 53 for reference)

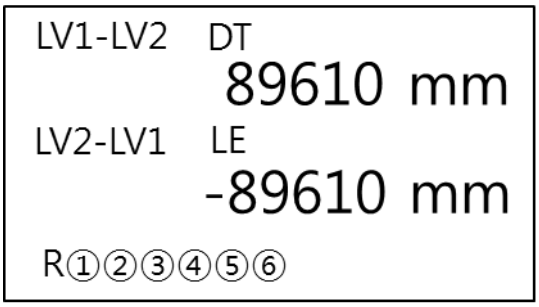
(2) Screen B

The screen display content is the same as the Screen A type, but in the Screen B type, the information for both Channel 1 and Channel 2 is displayed simultaneously. If only Sensor Channel 1 is connected, the Screen B type will not be displayed.



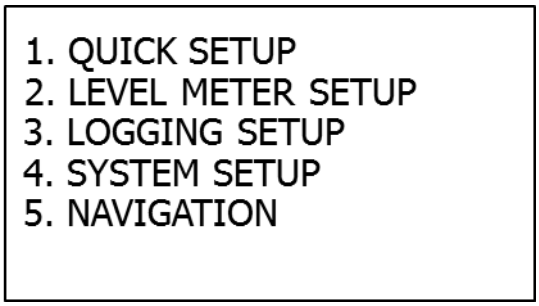
(3) Screen C

The screen display content is the same as Screen A and B types, while Screen C type displays the level difference between Sensor Channel 1 and Channel 2. This screen is only displayed when two channels are being measured



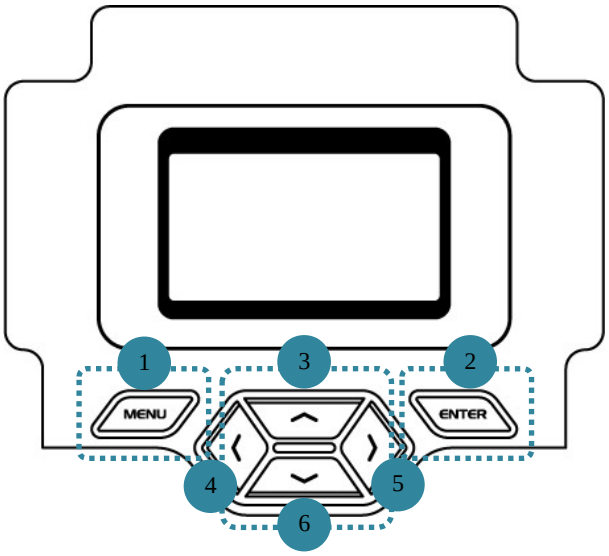
5.2.2 Setting Mode

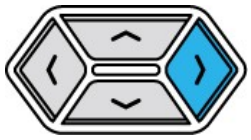
In the measurement screen mode, pressing the [MENU] button will switch to the settings screen mode, where the following content will be displayed.



Setting	Description
QUICK SETUP	This is a collection of frequently used menus for level gauge settings, allowing you to easily configure parameters.
LEVEL METER SETUP	The menu for more detailed settings, such as LEVEL, VOLUME, and RELAY.
LOGGING SETUP	Menu for logging-related settings, such as logging intervals.
SYSTEM SETUP	Menu for system-related settings.
NAVIGATION	Allows you to directly navigate to a specific menu by entering its designated number.

5.3 Operation Buttons

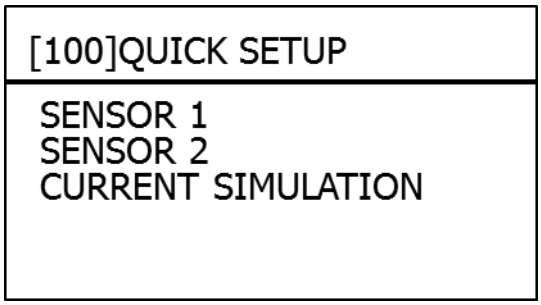


1		· Switch to the setting mode where menus can be configured from the measurement mode. · Press the [MENU] button in the setting mode to switch back to the measurement mode.
2		· In the setting mode, pressing the button will select the corresponding menu.
3		· Move the menu item up or change the setting value. If you hold the button while entering the setting value, the value will change more quickly.
4		· Move the menu item down or change the setting value. If you hold the button while entering the setting value, the value will change more quickly.
5		· Move from a submenu to a higher-level menu. · It is used for digit changes in the setting screen mode
6		· Navigate to a submenu or switch to the setting value change mode in the menu screen. (Performs the same function as the ENTER button) · It is used for digit changes in the setting screen mode.

6. Setting Menu

6.1 QUICK SETUP

QUICK SETUP is designed for user convenience by compiling frequently used menus for level gauge settings, allowing parameters to be configured easily.

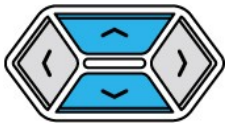


Info

This manual is based on the scenario where both Sensor Channel 1 and Sensor Channel 2 are connected. If only Sensor Channel 1 is connected, the displayed screens may differ from those described in this manual.

Setting	Description
SENSOR 1	The configuration menu for the sensor connected to Sensor 1 on the terminal block.
SENSOR 2	The configuration menu for the sensor connected to Sensor 2 on the terminal block.
CURRENT SIMULATION	A menu for testing current outputs OUTPUT 1 and OUTPUT 2. It allows you to select arbitrary values such as 3.8mA, 4mA, 12mA, 20mA, 22mA, or Measure to verify if the current output is functioning correctly.

How to Use the Buttons

	· Detailed Value Configuration
	· Move to Parent or Subdirectory Menu · Movement for Detailed Value Configuration
	· Complete Input and Save

	· Switch from Measurement Mode to Setup Mode · Switch from Setup Mode to Measurement Mode by Pressing the [MENU] Button

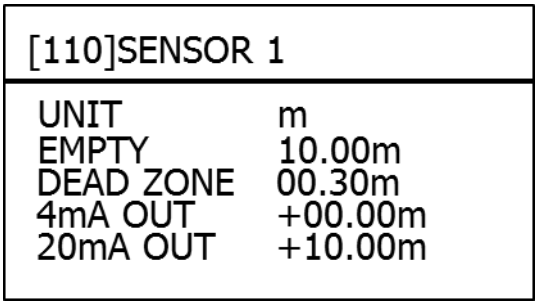


In setup mode, pressing the [MENU] key will always display a popup window for saving the settings. After pressing the ENTER key to save the settings, it will automatically switch to measurement mode.

When changing the settings of multiple items within the same directory, make all the desired changes to the menu items first, and then press ENTER at the end to save the values.

6.1.1 SENSOR 1

Configure the detailed menu for Sensor 1.



① **UNIT**

This is the menu where you can select the unit for the measured value.

Measurement Range: mm, cm, m, in, yd, in, ft

Unit	Range
mm	10000
cm	1000
m	10
in	393.70
yd	10.94
Ft	32.81

② **EMPTY**

This menu allows you to set the distance from the bottom surface of the sensor to the bottom of the measurement tank. The input unit changes according to the selected measurement unit.

Sensor	Maximum configurable range	Factory default settings
SR50	0.5ft – 49.2ft (0.15~15.00m)	16ft (5.00m)

③ **DEAD ZONE**

This menu allows you to set the dead zone distance from the sensor. Since the radar sensor functions as both a transmitter and receiver, it cannot measure distances up to a certain point from the sensor's surface. This distance is referred to as the dead zone.

Sensor	Maximum configurable range	Factory default settings
SR50	0.3ft – 49.2ft (0.10~15.00m)	0.6ft (0.2m)

④ **4mA OUT**

This mode is used to set the distance at which the current output becomes 4mA. Typically, this distance corresponds to the zero level of the water level.

Sensor	Maximum configurable range	Factory default settings
SR50	+/-328ft (+/- 9.99m)	0.00

⑤ **20mA OUT**

This mode is used to set the distance at which the current output reaches 20mA. Typically, this distance corresponds to the maximum water level (100%).

Sensor	Maximum configurable range	Factory default settings
SR50	+/-328ft (+/-99.99m)	16ft (5.00m)



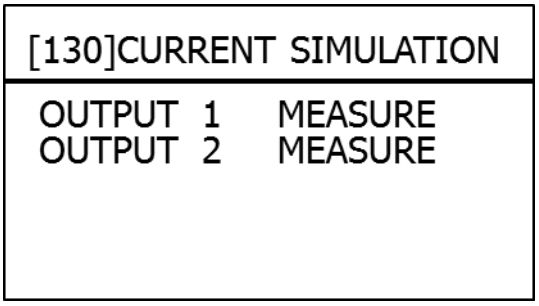
When setting the 20mA current output, the dead zone distance of 20cm must be excluded from the setting. If the water level changes within the configured dead zone distance, the displayed value may differ from the actual water level.

6.1.2 SENSOR 2

Same as the Sensor 1 configuration menu

6.1.3 CURRENT SIMULATION

This feature allows you to simulate the current output and cable connection status between the product and the central control room. When entering the CURRENT SIMULATION menu, the measurement stops, and the current output is initialized to 0.

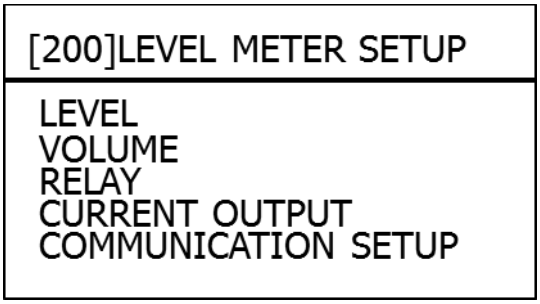


Setting	Description

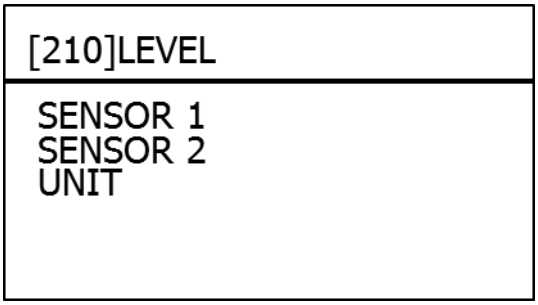
OUTPUT 1	When selecting the current values for Current Output 1 and 2, the output will be set to the corresponding selected current value. • MEASURE • 3.8mA • 4mA • 12mA • 20mA • 22mA
OUTPUT 2	Same as OUTPUT 1

6.2 LEVEL METER SETUP

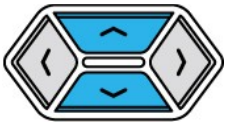
This menu is used for setting configurations related to level, distance, and volume measurements using the sensor, as well as settings for Relay, Current Output, and Communication.



6.2.1 LEVEL

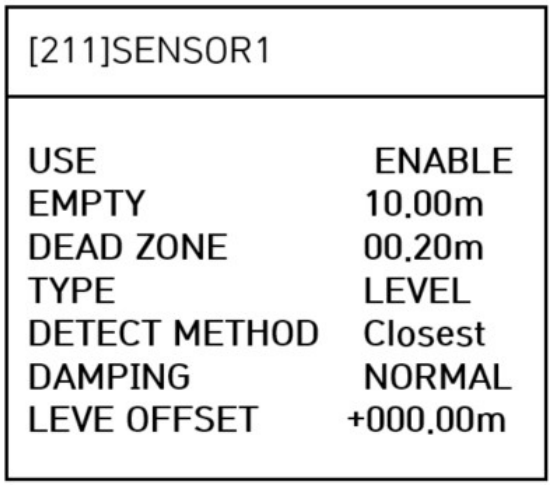


How to use the buttons

	· Detailed Value Configuration
	· Move to Parent or Subdirectory Menu · Movement for Detailed Value Configuration

	· Complete Input and Save
	· Switch from Measurement Mode to Setup Mode · Switch from Setup Mode to Measurement Mode by Pressing the [MENU] Button

(1) SENSOR 1



① **USE**

This menu allows you to select whether to enable or disable the sensor channel. Choose ENABLE if the sensor is in use, or DISABLE if the sensor is not in use.

② **EMPTY**

This menu is used to set the distance from the radar sensor to the bottom. The input unit depends on the selected UNIT.

Sensor	Maximum configurable range	Factory default settings
SR50	0.66ft (0.20~15.00m)	16ft (5.00m)

③ **DEAD ZONE**

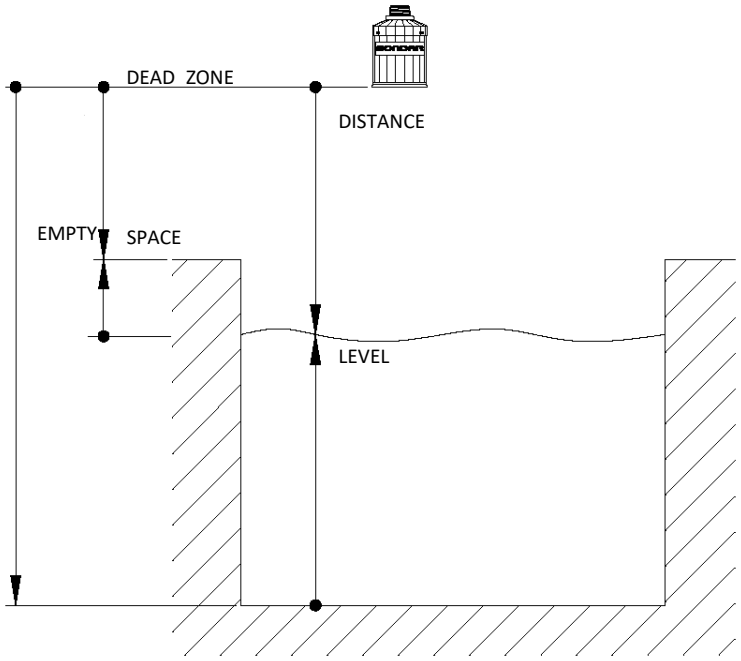
This menu allows you to set the dead zone distance from the sensor. Since the radar sensor functions as both a transmitter and receiver, it cannot measure distances up to a certain point from the sensor's surface. This distance is referred to as the dead zone.

Sensor	Maximum configurable range	Factory default settings
SR50	0.66ft (0.20~15.00m)	0.66ft (0.2m)

④ **TYPE**

This menu allows you to select the type of measured value displayed in measurement mode.

- Distance: Displays the distance from the bottom surface of the sensor to the measured object.
- Level: Displays the distance from the bottom surface to the measurement point.
- Space: Displays the distance from the bottom surface of the sensor to the measured object, excluding the dead zone.
- Volume: Displays the volume (capacity) of the contents in the currently measured tank.



⑤ **DAMPING**

This menu allows you to set the rate at which the output changes in response to variations in the water level.

Select Item	Slow	Normal	Fast	Very Fast
Speed	0.1m/min	1m/min	10m/min	100m/min

⑥ **DETECT METHOD**

You can select a valid level signal based on surrounding obstacles and signal strength.
Closest: Adopts the first signal received as the level value.
Strongest: Adopts the strongest signal among multiple reflected signals as the level value.

⑦ **LEVEL OFFSET**

This menu allows you to add a specific value (Offset) to the level display for special environments, rather than typical water level measurement. The water level is measured in the usual manner, but the displayed value will be adjusted by the specified offset, either adding or subtracting the set

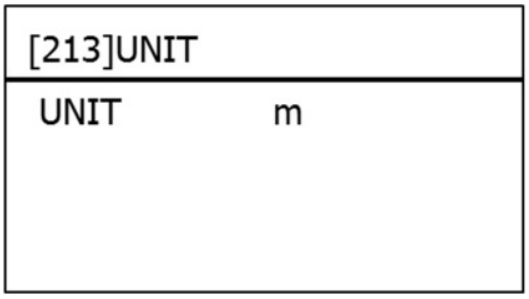
value.

Actual Water Level	OFFSET	Displayed water level value.
15ft	+10	25ft
15ft	-10	5ft

(2) SENSOR 2

Same as Sensor 1 Setting menu

(3) UNIT



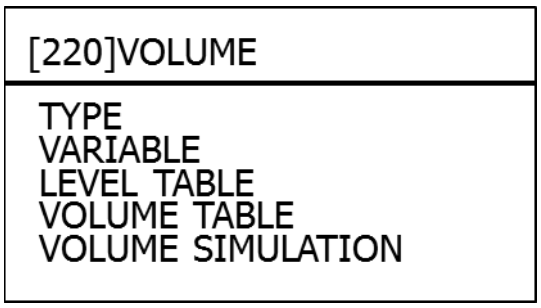
① **UNIT**

This menu allows you to select the unit for displaying the measured values.

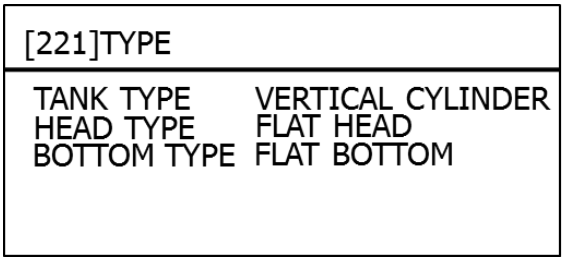
Selectable units: mm, cm, m, in, yd, ft

6.2.2 VOLUME

The capacity (volume) of the contents in the currently measured tank is referred to as VOLUME. When measuring VOLUME, units such as mm, cm, and m are automatically converted and displayed in m^3, while units like in, yd, and ft are converted to gallons.



(1) TYPE

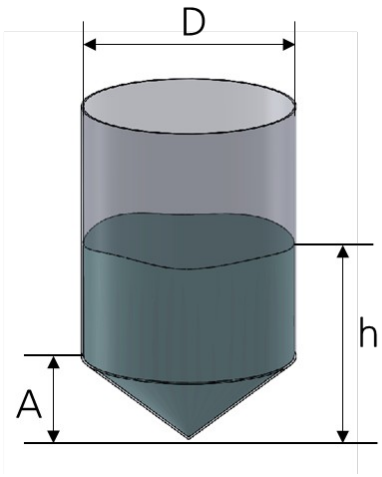


VERTICAL CYLINDER TANK TYPE

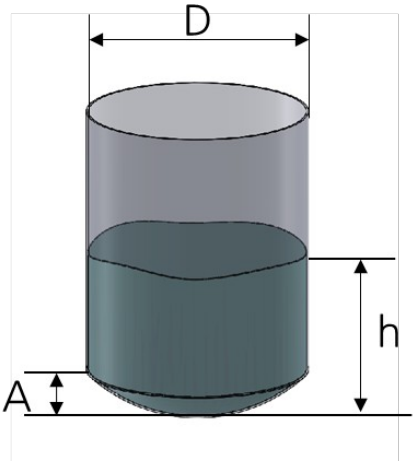
TANK TYPE	This menu allows you to select the shape of the tank being measured. • VERTICAL CYLINDER • HORIZONTAL CYLINDER • SPHERE • USER DEFINE
HEAD TYPE	This menu allows you to select the HEAD TYPE of the tank. • CONICAL HEAD • ELLIPSOIDAL HEAD • GUPPY HEAD • SPHERICAL HEAD • FLAT HEAD

	**This setting is only applicable for HORIZONTAL cylinders and does not apply to other tank types.**

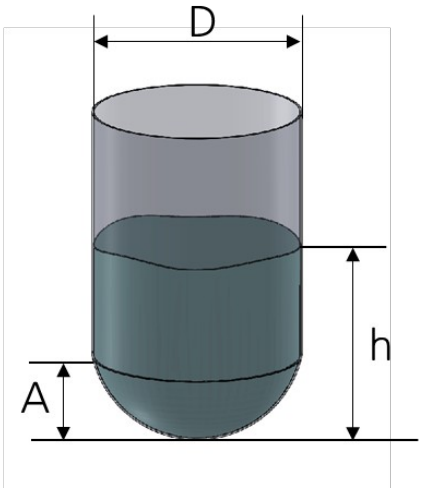
BOTTOM TYPE	Select the BOTTOM TYPE of the tank • CONICAL BOTTOM • ELLIPSOIDAL BOTTOM • SPHERICAL BOTTOM • FLAT BOTTOM



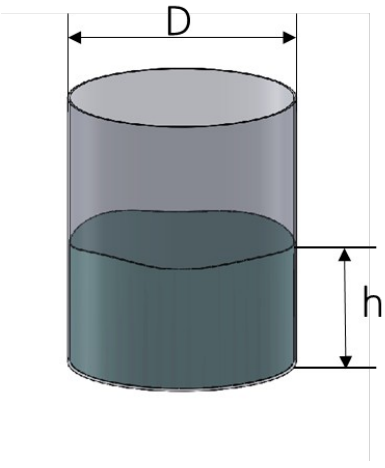
CONICAL BOTTOM TYPE



ELLIPSOIDAL BOTTOM TYPE

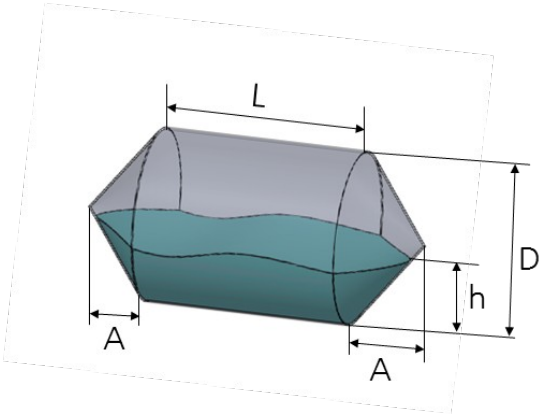


SPHERICAL BOTTOM TYPE

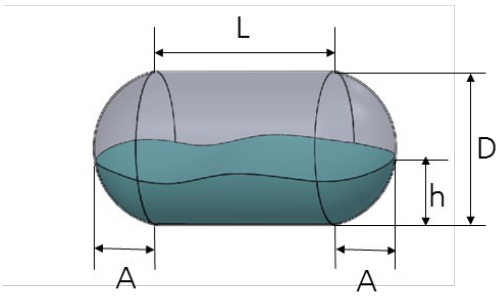


FLAT BOTTOM TYPE

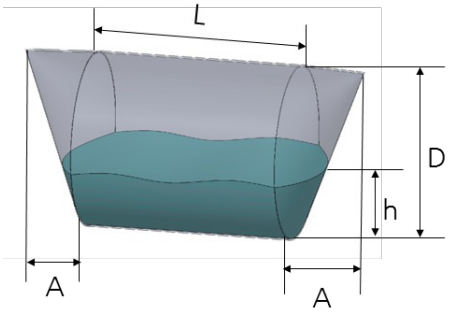
HORIZONTAL CYLINDER TANK TYPE



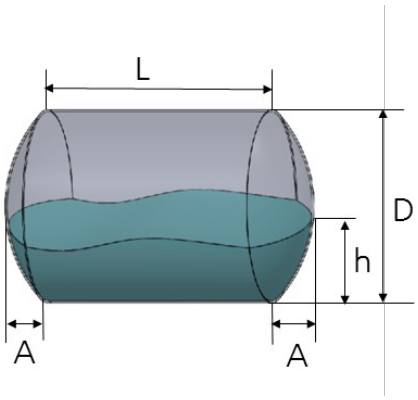
CONICAL HEAD TYPE



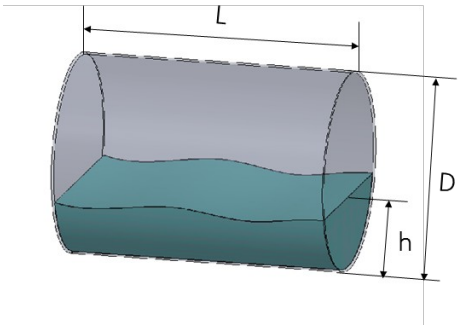
ELLIPSOIDAL HEAD TYPE



GUPPY HEAD TYPE



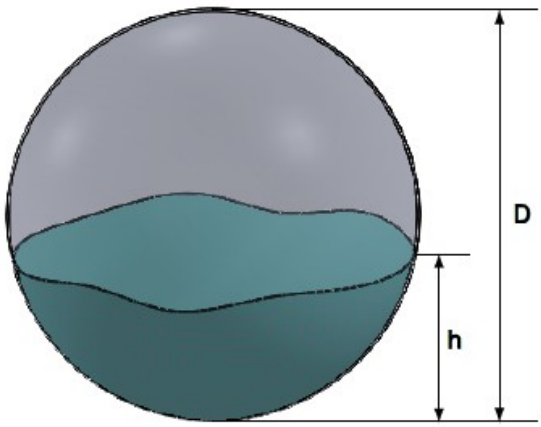
SPHERICAL HEAD TYPE



FLAT HEAD TYPE

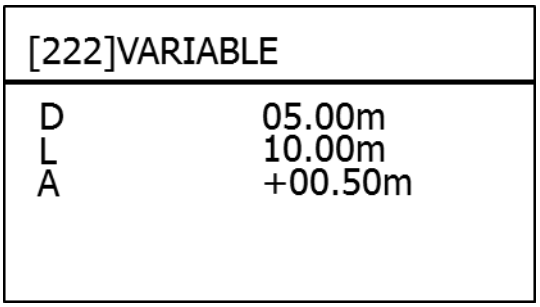
D: Tank diameter
L: Length of the straight section
A: Length of HEAD
h: Measured level

SPHERE TANK TYPE



D: Tank diameter	h: Measured level

(2) VARIABLE

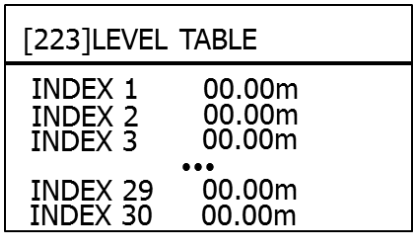


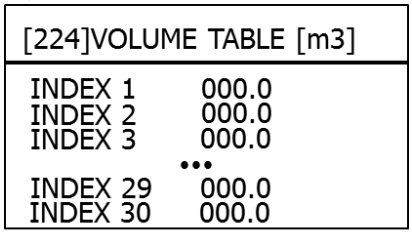
Menu	Description
D	This menu allows you to enter the diameter of the tank. For a SPHERE TANK, enter the value of 2r (twice the radius).
L	This menu allows you to enter the length of the straight section for a HORIZONTAL CYLINDER tank.
A	This menu allows you to enter the length of the HEAD and BOTTOM for VERTICAL CYLINDER and HORIZONTAL CYLINDER tanks.

Info	**Please refer to the tank diagram on page 42.**

(3) LEVEL/ VOLUME TABLE

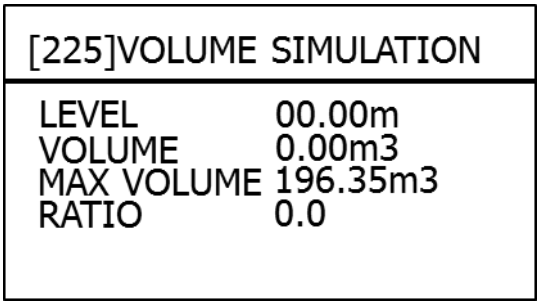
This menu is used when the tank type is set to USER DEFINE.





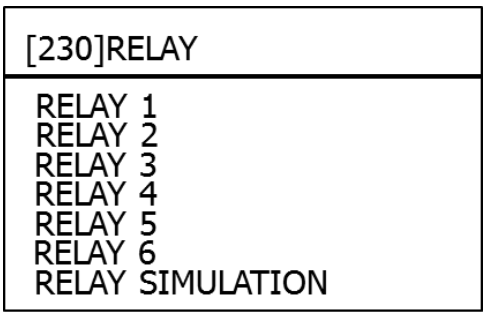
Menu	Description
INDEX	This menu allows you to divide the installed tank into up to 30 points. The LEVEL and VOLUME values at each point are entered at the same index and saved in a table.

(4) VOLUME SIMULATION

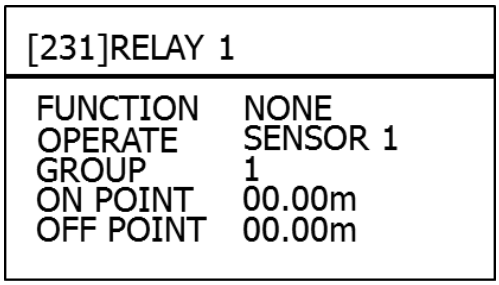


Menu	Description
LEVEL	This menu allows you to enter arbitrary LEVEL values that will be used for VOLUME calculation.
VOLUME	The VOLUME value is calculated and displayed based on the entered LEVEL values.
MAX VOLUME	The MAX VOLUME of the currently configured tank is displayed.
RATIO	The [VOLUME] and [MAX VOLUME] values are displayed.

6.2.3 RELAY



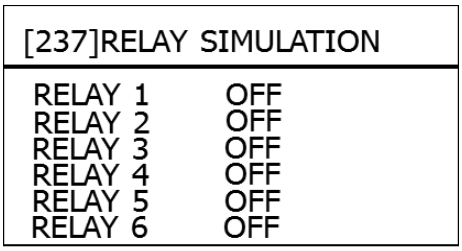
(1) RELAY 1~6



Menu	Description
FUNCTION	This menu allows you to select the relay operation mode. **NONE**: This option disables the use of the respective relay. **LIMIT**: The relay operates according to the configured ON/OFF POINT values. **ALTERNATE**: The relay operates sequentially based on the configured ON/OFF POINT values of the group and the measured values. Ex) If Relay 1 and Relay 2 are in GROUP 1, Relay 1 will operate until the first ON/OFF point is reached, and then Relay 2 will operate at the subsequent ON/OFF point. This behavior will repeat accordingly. **ALARM**: The alarm signal feature is activated if an error persists for a duration equal to or greater than the Fail Safe Time value.
OPERATE	This menu allows you to select the sensor that controls the operation of the respective relay. Options: SENSOR 1 / SENSOR 2.
GROUP	This menu allows you to specify the group used for ALTERNATE (alternating operation). Selection range: 1–3.
ON POINT	This menu allows you to set the point at which the relay turns ON. If the OFF POINT is smaller than the ON POINT, the relay will turn ON when the measured value reaches or exceeds the ON POINT. If the OFF POINT is larger than the ON POINT, the relay will turn ON when the measured value is less than or equal to the ON POINT.
OFF POINT	This menu allows you to set the point at which the relay turns OFF. If the OFF POINT is smaller than the ON POINT, the relay will turn OFF when the measured value is less than or equal to the OFF POINT. If the OFF POINT is larger than the ON POINT, the relay will turn OFF when the measured value exceeds the OFF POINT.

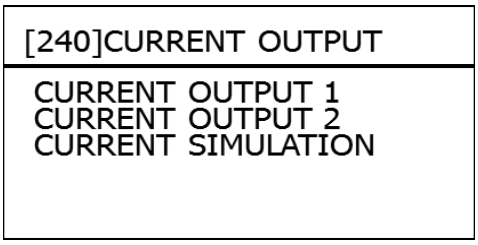
(2) RELAY SIMULATION

This menu allows you to manually test the relay by turning it ON or OFF at will.

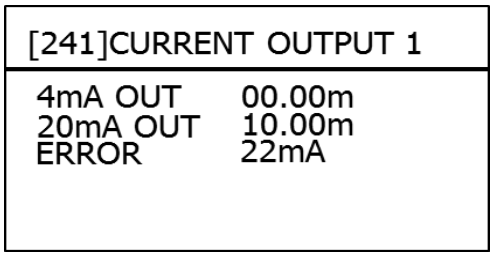


6.2.4 CURRENT OUTPUT

This menu is used to configure the settings required to convert the measured values into current output.



(1) CURRENT OUTPUT 1

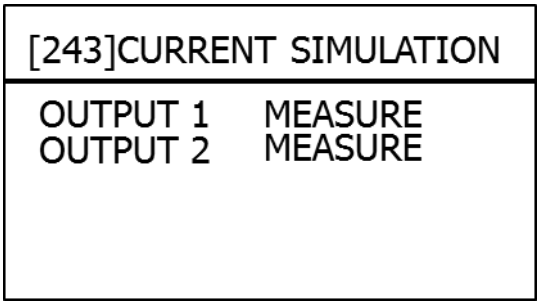


Menu	Description
4mA	This menu allows you to input the minimum level corresponding to the point where the current output reaches 4mA.
20mA	This menu allows you to input the maximum level corresponding to the point where the current output reaches 20mA.
ERROR	This menu is used to configure the behavior of the current output in case of an ERROR occurrence. • 3.8mA • HOLD • 22mA

(2) CURRENT OUTPUT 2

Same as CURRENT OUTPUT 1

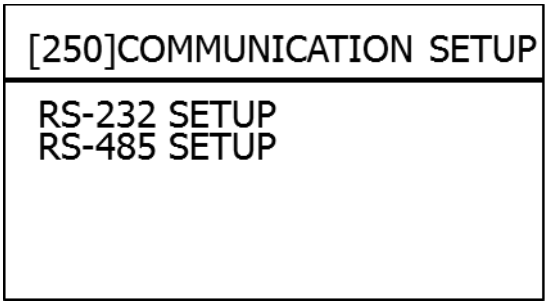
(3) CURRENT SIMULATION



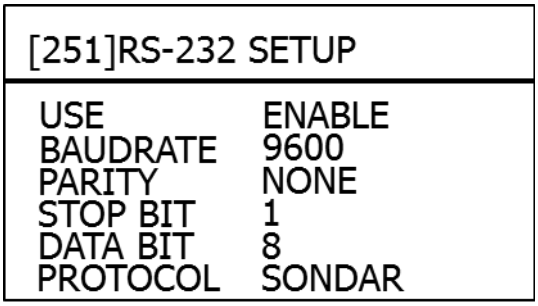
This menu allows you to set the output for CURRENT OUTPUT channels 1 and 2 to the selected values.

• 3.8mA	• 4mA	• 12mA
• 20mA	• 22mA	• MEASURE

6.2.5 COMMUNICATION SETUP



(1) RS-232 SETUP

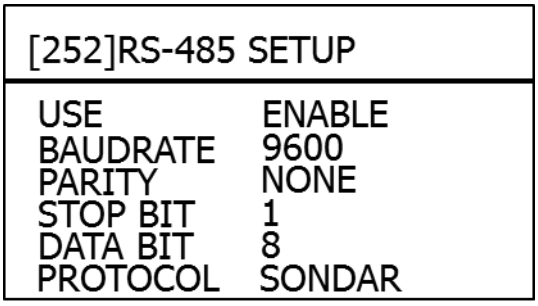


Menu	Description
USE	Select whether to enable or disable the use of RS-232. • ENABLE • DISABLE
BAUDRATE	Select the communication speed for RS-232. • 4800 bps • 9600 bps • 14400 bps • 19200 bps • 38400 bps • 57600 bps • 115200 bps
PARITY	Select whether to enable or disable the use of a parity bit. • None • Odd • Even
STOP BIT	Select the size of the STOP BIT for RS-232 transmission data. • 1 bit • 2 bit
DATA BIT	Select the data size for RS-232 transmission. • 8 bit • 9 bit
PROTOCOL	Select the protocol for measurement data output via RS-232. • FLOMOTION • BKCM • Modbus – RTU • Modbus–ASCII

Info	**The available selection options may vary depending on the communication option chosen at the time of product order.**

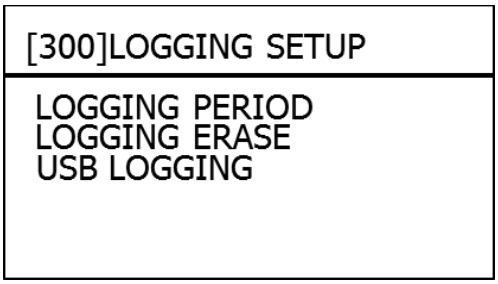
(2) RS-485 SETUP

Same as RS-232 SETUP



6.3 LOGGING SETUP

This menu allows you to configure the logging interval, delete logging records, and set up USB logging.



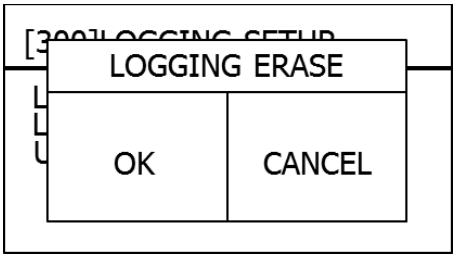
6.3.1 LOGGING PERIOD

This menu allows you to set the logging interval for the measurement data.

Data logging interval	Maximum storage duration
10 SEC	2 days
1 MINUTE	11 days
5 MINUTE	56 days
10 MINUTE	112 days
15 MINUTE	168 days
30 MINUTE	336 days
60 MINUTE	672 days

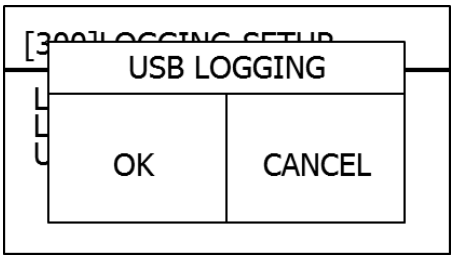
6.3.2 LOGGING ERASE

When you select the option to delete logging records, a pop-up will appear as shown below. By selecting "OK," you can reset the stored logging data.

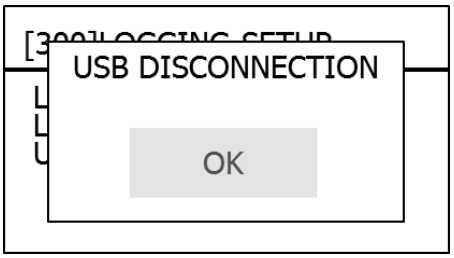


6.3.3 USB LOGGING

When a USB is connected, a pop-up will appear as shown below. By selecting "OK," the stored logging data will be transferred to the connected USB as an Excel file.

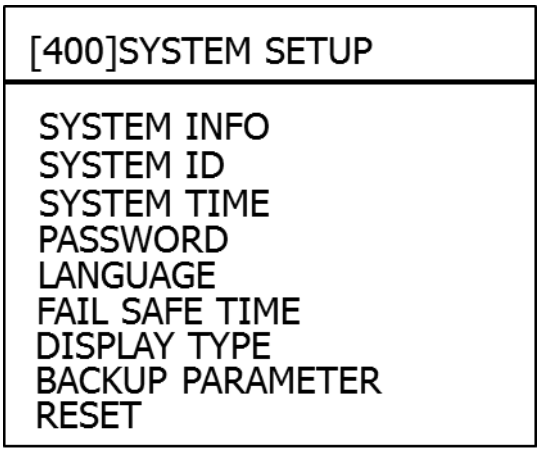


If the USB is not connected, a pop-up will appear as shown below. After connecting the USB, pressing the "OK" button will close the error pop-up.

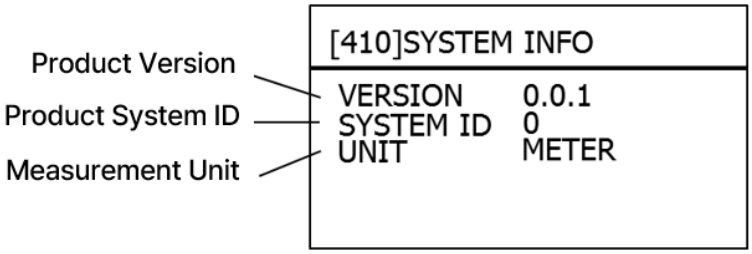


Menu	Description
SYSTEM ID	Set the SYSTEM ID used for the FLOMOTION Protocol.
Modbus ID	Set the Slave ID required when using the Modbus Protocol.

6.4 SYSTEM SETUP



6.4.1 SYSTEM INFO

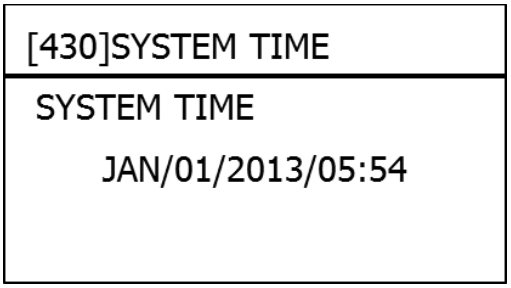


6.4.2 SYSTEM ID

This menu allows you to set the system ID.
Enter the setup mode by pressing the [ENTER] button, then use the [Up/Down] arrow buttons to input the setting value.
The range for the SYSTEM ID is 0 to 99, and the range for the Modbus ID is 1 to 247

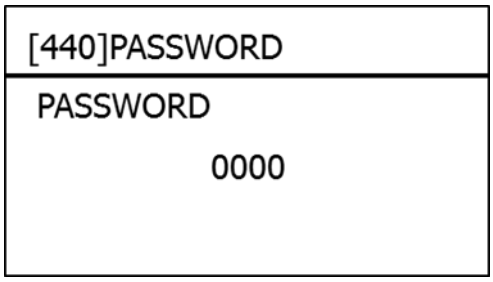
6.4.3 SYSTEM TIME

This menu allows you to set the system time.
Use the [Left/Right] arrow buttons to move the cursor between year, month, day, hour, and minute, and use the [Up/Down] arrow buttons to change the setting values.
The available range for the settings is from January 1, 2000, 00:00 to December 31, 2099, 23:59.



6.4.4 PASSWORD

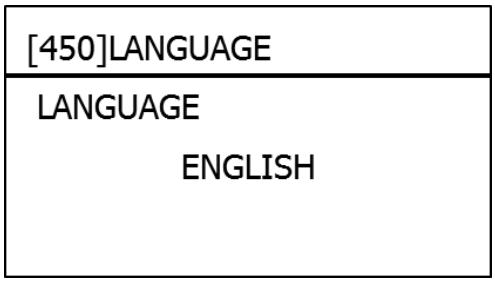
This menu allows the user to set a password. The password is not set at the time of factory shipment. After setting the password, it will be required to enter the password whenever there is a menu change. Use the [Up/Down/Left/Right] arrow buttons to select the desired 4-digit number, and press the [ENTER] button to save the password.
[Setting range: 0000~9999]



Caution	**If the password is lost, it will not be possible to switch to setup mode. Please be cautious when managing the password.**

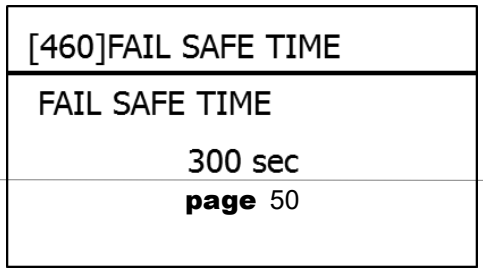
6.4.5 LANGUAGE

This menu allows you to set the system language. Currently, the supported language is English, and future updates will include Chinese and Korean.



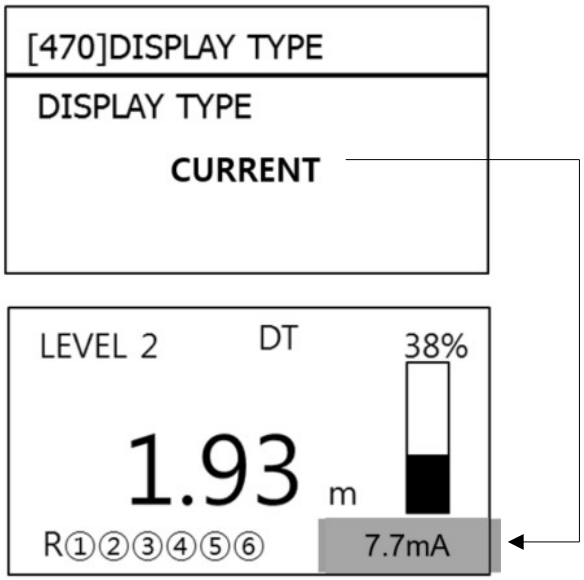
6.4.6 FAIL SAFE TIME

This menu allows you to set the duration for the error current and error alarm output in case the sensor value is not received due to equipment malfunction or external factors.
[Factory default value: 300 sec, Setting range: 20 ~ 999 sec]



6.4.7 DISPLAY TYPE

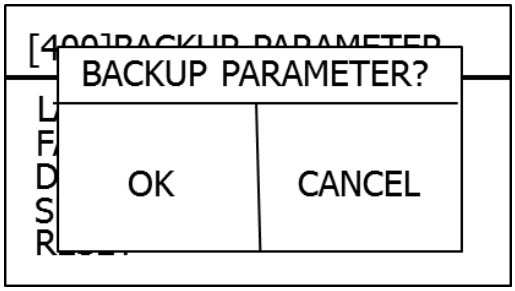
This feature allows you to display the CURRENT among the information shown on the measurement screen. The display type set in this menu will appear in the bottom right corner of the measurement screen. (See the diagram below.)



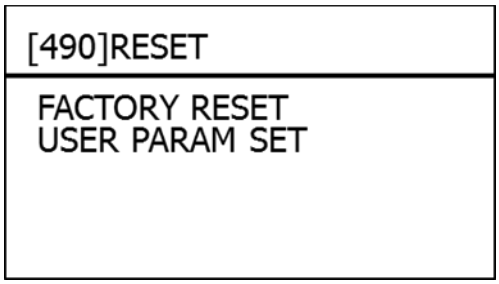
6.4.8 BACKUP PARAMETER

You can save the currently set menu values. When selecting the menu, a pop-up will appear as shown below. Use the [Left/Right] arrow buttons to move the cursor, and selecting "OK" will save the current settings.

In the future, when resetting, the saved values can be recalled and restored to their initial settings.

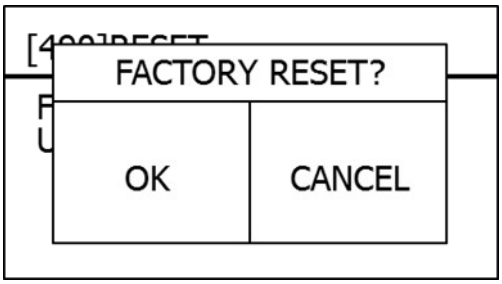


6.4.9 RESET



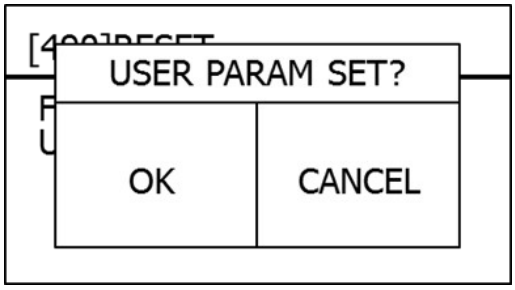
(1) FACTORY RESET

This menu allows you to reset the currently operating product. If the MASTER RESET function is selected, the settings will be restored to the factory default values.



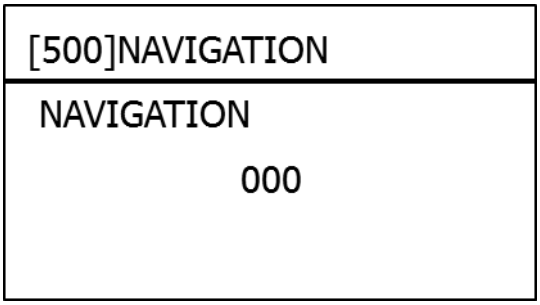
(2) USER PARAMETER SET

This menu allows you to reset the currently operating product. If the USER RESET function is selected, the settings will be restored to the values stored in the SETTING BACKUP.

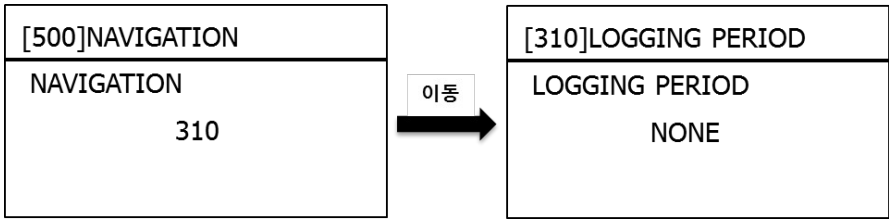


6.5 NAVIGATION

This menu allows the user to quickly access a desired menu by entering its specified number, if known.



For example, if you want to go to the LOGGING PERIOD menu, entering the menu number [310] will take you directly to that menu.



7. Operation Menu Overview

7.1 QUICK SETUP

QUICK SETUP(100)			
1st MENU	2nd MENU	Setting Range	Default
SENSOR 1 (110)	UNIT	mm/ cm/ m/ in/ yd/ ft	m
	EMPTY	0.2 ~ 15.00m	15m
	DEAD ZONE	0.2 ~15.00m	0.2m
	4mA OUT	-99.99 ~ 99.99m	0m
	20mA OUT	-99.99 ~ 99.99m	15m
SENSOR 2 (120)	UNIT	mm/ cm/ m/ in/ yd/ ft	m
	EMPTY	0.2 ~ 15.00m	15m
	DEAD ZONE	0.2 ~ 15.00m	0.2m
	4mA OUT	-99.99 ~ 99.99m	0m
	20mA OUT	-99.99 ~ 99.99m	15m
CURRENT SIMULATION (130)	OUTPUT 1	MEASURE/ 3.8mA/ 4mA/ 12mA/ 20mA/ 22mA	MEASURE
	OUTPUT 2	MEASURE/ 3.8mA/ 4mA/ 12mA/ 20mA/ 22mA	MEASURE

Info	**If there is only one sensor channel, the SENSOR 2 option will not be displayed.**

7.2 DETAIL MENU

DETAIL MENU					
1st MENU	2nd MENU	3rd MENU	4th MENU	Configuration Range	Default
LEVEL METER SETUP (200)	LEVEL (210)	SENSOR 1 (211)	USE	ENABLE/DISABLE	ENABLE
			EMPTY	0.2 ~ 15.00m	15m
			DEAD ZONE	0.2 ~ 15.00m	0.2m
			TYPE	DISTANCE/ LEVEL/ SPACE/ VOLUME	LEVEL
			DAMPING	SLOW/ NORMAL/ FAST/ VERY FAST	NORMAL
			DETECT METHOD	CLOSEST/ STRONGEST	CLOSEST
			LEVEL OFFSET	-99m~999.9m	0m
		SENSOR 2 (212)	SAME MENUS AS SENSOR 1 ABOVE		
		UNIT (213)	UNIT	mm/ cm/ m/ in/ yd/ ft	meter

DETAIL MENU					
1st MENU	2nd MENU	3rd MENU	4th MENU	Configuration Range	Default
LEVEL METER SETUP (200)	VOLUME (220)	TYPE (221)	TANK TYPE	HORIZONTAL CYLINDER/ VERTICAL CYLINDER/ SPHERE/ USER DEFINE	VERTICAL CYLINDER
			HEAD TYPE	CONICAL HEAD/ ELLIPSOIDAL HEAD/ GUPPY HEAD/ SPHERICAL HEAD/ FLAT HEAD	FLAT HEAD
			BOTTOM TYPE	CONICAL BOTTOM/ ELLIPSOIDAL BOTTOM/ SPHERICAL BOTTOM/ FLAT BOTTOM	FLAT BOTTOM
		VARIABLE (222)	D	Tank Diameter (0~50M)	5M
			L	Tank Length/Height (0~15M)	10M
			A	Head/bottom Width (-15M~15M) (+ : convex / - concave)	0.5M
		LEVEL TABLE (223)	INDEX1~ INDEX30	The LEVEL TABLE and VOLUME TABLE with the same INDEX are matched on a 1:1 basis.	0
		VOLUME TABLE (224)	INDEX1~ INDEX30	The LEVEL TABLE and VOLUME TABLE with the same INDEX are matched on a 1:1 basis. For input units: If the unit is m, cm, or mm, the input should be in m^3. If the unit is in, yd, or ft, the input should be in gallons.	0
		SIMULATION (225)	LEVEL	Input of Virtual Level Values	0
			VOLUME	Display of Volume Calculation Results Based on the Input Level Value	
			MAX VOLUME	Display of the Total Volume of the Currently Configured Tank	
			RATIO	Display of the Ratio Between Volume and Max Volume	
	RELAY (230)	RELAY 1 (231) RELAY 2 (232) RELAY 3 (233) RELAY 4 (234) RELAY 5 (235) RELAY 6 (236)	FUNCTION	NONE/ LIMIT/ ALTERNATE/ ALARM	NONE
			OPERATE	SENSOR 1 / SENSOR 2	SENSOR 1
			GROUP	1~3	1
			ON POINT	0~15.5m	0
			OFF POINT	0~15.5m	0
		RELAY SIMULATION(237)	RELAY 1~ RELAY 6	ON/ OFF	OFF
	CURRENT OUTPUT (240)	CURRENT OUTPUT 1 (241) CURRENT OUTPUT 2 (242)	4mA	-99.99 ~ 99.99m	0m
			20mA	-99.99 ~ 99.99m	10m
			ERROR	HOLD/ 3.8mA/ 22mA	22mA
		CURRENT SIMULATION(243)	OUTPUT 1~2	MEASURE/ 3.8mA/ 4mA/ 12mA/ 20mA/ 22mA	MEASURE

DETAIL MENU					
1st MENU	2nd MENU	3rd MENU	4th MENU	Configuration Range	Default
	COMMUNICATION SETUP (250)	RS-232 SETUP (251)	USE	ENABLE/ DISABLE	ENABLE
			BAUDRATE	4800, 9600, 14400, 19200, 38400, 57600, 115200	9600
			PARITY	NONE/ ODD/ EVEN	NONE
			STOP BIT	1 or 2	1
			DATA BIT	8 or 9	8
			PROTOCOL	FLOMOTION / BKCM/ Modbus-RTU/ Modbus-ASCII	FLOMOTION
		RS-485 SETUP (252)	USE	ENABLE/ DISABLE	DISABLE
			BAUDRATE	4800, 9600, 14400, 19200, 38400, 57600, 115200	9600
			PARITY	NONE/ ODD/ EVEN	NONE
			STOP BIT	1 or 2	1
			DATA BIT	8 or 9	8
			PROTOCOL	FLOMOTIONFLOMOTION / BKCM/ Modbus-RTU/ Modbus-ASCII	FLOMOTION
LOGGING SETUP (300)	LOGGING PERIOD (310)	LOGGING PERIOD		NONE/ 10 SEC/ 1 MINUTE/ 5 MINUTE/ 10 MINUTE/ 15 MINUTE/ 30 MINUTE/ 60 MINUTE	NONE
	LOGGING ERASE (320)				
	USB LOGGING (330)				
	SYSTEM INFO (410)				
	SYSTEM ID (420)	SYSTEM ID		0~99	0
		MODBUS ID		1~247	1
	SYSTEM TIME (430)	SYSTEM TIME		2000/00/00/ 00:00 ~ 2099/12/31 23:59	2013/1/1/00:00
	PASSWORD (440)	PASSWORD		0~9999	0
	LANGUAGE (450)	LANGUAGE		ENGLISH	ENGLISH
	FAIL SAFE TIME (460)			20~999 sec (Initial value 300 sec)	300 sec
	DISPLAY TYPE (470)			CURRENT	-
	BACKUP PARAMETER (480)				
	RESET (490)	FACTORY RESET (491)			
		USER PARAM SET (492)			
NAVIGATION (500)					

8. Maintenance

1. Built-in Battery

The built-in battery in the RLM7000 is a CR-2032 model.

Its average lifespan is 10 years, but it may be shortened depending on the operating environment temperature.

Please replace the battery before it is fully consumed.

Caution	**Due to battery depletion, TIME DATA backup will not be performed in the event of a power outage.** **In this case, the company will not be held responsible.**

2. Sensor

- Please regularly check for any short circuits in the cable between the sensor and the controller.
- Please regularly inspect the underside of the sensor for any accumulated contaminants and remove them as needed.

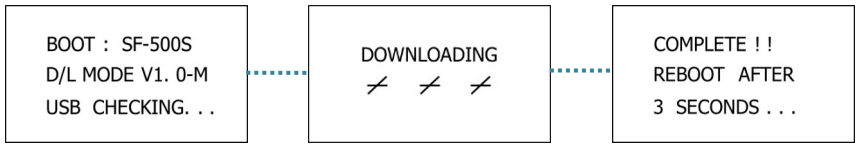
3. Controller

- Please regularly check that the current output is within the normal range of 4-20mA.
- Please regularly check that the display matches the actual level value.
- Please regularly check that the rated power supply is applied.
- Please regularly check that no noise is occurring on the Echo Trend screen.

4. USB Firmware Download

Copy the firmware to the root directory of the USB memory (**File system: FAT32**).

Connect the USB memory to the instrument, and while holding the ENTER key, turn on the power to download the firmware.



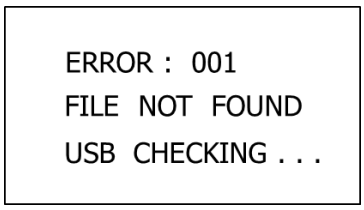
Info

The firmware is divided into two types based on Modbus and Serial communication (RS-232/485).

The Modbus-specific firmware is labeled as D/L MODE V.1.0-M, while the Serial communication firmware is labeled as D/L MODE V.1.0-S. These are not compatible with each other, so please ensure that you download the firmware that matches the communication type you are using.

Firmware Download Error

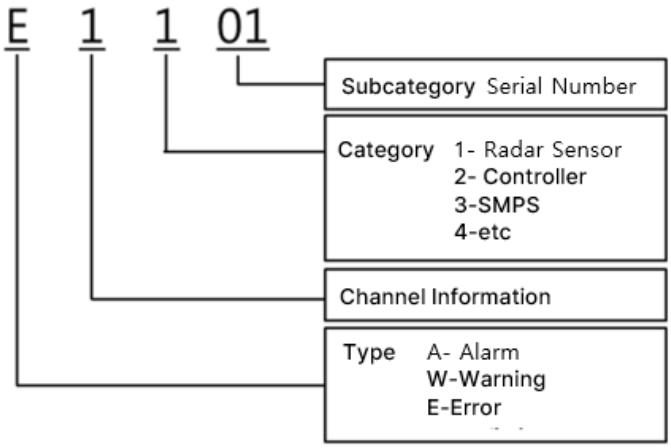
If the Firmware File cannot be found on the connected USB



9. Troubleshooting

9.1 Error Code

The RLM7000 stores 10 error codes. Users can perform self-diagnosis and troubleshoot based on these error codes, which helps reduce downtime and costs associated with product failures.
The error codes consist of five characters, a combination of letters and numbers, and the meaning of each position is as follows:



9.2 Self-Diagnosis

If an error code is displayed on the screen, please refer to the table below to resolve the issue.
If the issue cannot be resolved using this method, please contact the company for further assistance.

Info	**A QR code label with an explanation of the error codes is attached inside the controller.** **In case it is not possible to bring the manual to the site, please scan the QR code to access the information.**

ERROR CODE	Cause of the problem	Reference Page
E1101	Sensor 1 Not Detected	63
E2101	Sensor 2 Not Detected	64
E0101	Neither Sensor 1 nor Sensor 2 is Detected	64
E0201	The flash memory inside the controller is not functioning properly.	65
E0202	The EEPROM inside the controller is not functioning properly.	66
E0203	The Real-Time Clock inside the controller is not functioning properly.	66
E1204	The received signal from Sensor 1 is not normal.	66
E2204	The received signal from Sensor 2 is not normal.	67
E0204	The received signals from Sensor 1 and Sensor 2 are not normal.	67

E1101

This error occurs when Sensor 1 is either not connected or is not detected even though it is connected.

To resolve the issue, please proceed as follows:

When the sensor is not functioning:

1) Check visually or with a tester to see if the sensor cable is cut or shorted. If any issues are found, repair or replace the cable. If the problem persists, proceed to step (3).

2) Ensure that the sensor cable is properly connected to the correct terminals on the controller. Gently pull the connected cable to confirm the wiring status. If any issues are found, correctly rewire the connections.

3) If the issue persists after performing steps (1) and (2), please contact the service center or the place of purchase for assistance.

4) If you have a spare sensor, try replacing it with the spare sensor and test the system. If the new sensor works, the original sensor is likely defective. If the system still does not function correctly with the replacement sensor, the controller may be at fault.

5) If the sensor is defective, it will need to be replaced or repaired. Please contact the service center or the place of purchase for further assistance.

E2101

This error occurs when Sensor 2 is either not connected or is not detected even though it is connected. To resolve the issue, please proceed as follows:

The procedure is the same as for E1101 (see page 63).

E0101

This error occurs when both Sensor 1 and Sensor 2 are either not connected or are not detected even though they are connected. To resolve the issue, please proceed as follows:

The procedure is the same as for E1101 (see page 63).

E0201

This error occurs when the flash memory inside the controller is not functioning properly.

To resolve the issue, please proceed as follows:

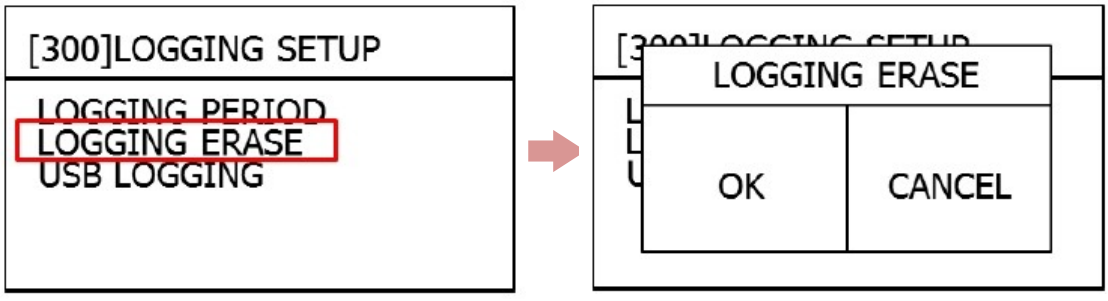
- **Logging Data Recovery**

  If the flash memory is malfunctioning, it may be difficult to recover the previously stored data. If data recovery is required, you must send the product to the service center for assistance.

- **Logging Data Deletion**

(1) Attempt to reset the flash memory through the menu.

(2) 3. In the [300] LOGGING SETUP menu, select LOGGING ERASE. This will erase the existing logging data and reset the memory.



(3) If the same issue occurs after the reset, please contact the service center or the place of purchase for assistance.

E0202

This error occurs when the EEPROM inside the controller is not functioning properly.

To resolve the issue, please proceed as follows:

- **Please contact the service center.**
- The EEPROM stores critical information related to the instrument and is a component that should not be handled by untrained personnel. If detailed inspection and repair are required, please contact the service center or the place of purchase.

E0203

This error occurs when the Real-Time Clock inside the controller is not functioning properly.

To resolve the issue, please proceed as follows:

- **Please contact the service center.**
- The Real-Time Clock is a sensitive component that should not be handled by untrained personnel. If detailed inspection and repair are required, please contact the service center or the place of purchase.

E1204

This error occurs when "LE" is flashing on the screen and the signal received from Sensor 1 is not being properly detected.

To resolve the issue, please proceed as follows:

Check the Sensor Installation Location	(1) Please check if the sensor is installed perpendicular to the measured object. If the measurement is correct, it will be displayed as "DT."
Check for Contamination on the Bottom of the Sensor	(2) Please check if there are any foreign objects on the sensor's emission surface. If the emission surface is contaminated, clean it with a soft cloth.
Check the Bottom Distance Setting	(3) Please check if the EMPTY value is set within the specified range.
	(4) If the issue persists, please contact the service center or the place of purchase.

E2204

This error occurs when "LE" is flashing on the screen and the signal received from Sensor 2 is not being properly detected. To resolve the issue, please proceed as follows:

The procedure is the same as for E1101 (see page 63).

E0204

This error occurs when "LE" is flashing on the screen and the signals received from both Sensor 1 and Sensor 2 are not being properly detected. To resolve the issue, please proceed as follows:

The procedure is the same as for E1101 (see page 63).

APPENDIX A.
RS-232/RS-485 Protocol

APPENDIX A. RS-232/RS-485 Protocol

1. FLOMOTION Protocol

1.1 Output Data Format

The data is output in ASCII code format, and the data transmission sequence is as follows:

Data Field	DATA Start						System ID			Year			Month			Day			Hour			Minute		
Byte Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Data	:	D	A	T	A		0	0		2	0	1	3		0	1		0	1		0	0		0	0	
Data Field	Second			Unit		SENSOR1 Level							SENSOR2 Level							SENSOR1- SENSOR2 Level						
Byte Number	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Data	0	0		M		0	0	0	0	0	0		0	0	0	0	0	0		0	0	0	0	0	0	
Data Field	SENSOR1- SENSOR2 Level							SENSOR1 Volume											SENSOR2 Volume							
Byte Number	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78
Data	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0
Data Field	Temperature unit			SENSOR1 Temperature									SENSOR2 Temperature							DATA End						
Byte Number	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99					
Data		C		+/-	0	0	0	0	.	0		+/-	0	0	0	0	.	0		₩n	₩r					

The blank space in the above table represents space (0x20).

Example of Data Output:

:DATA 01 2013 01 01 01 06 15 M 009.60 000.00 009.60 -09.60 000188.46 000000.00 C +0024.0 +0000.0

1.2 Output Data

System ID	Displays the System ID.
Year/Month/Day/Hour/ Minute/Second	Displays the current system time.
Unit	Indicates the unit of the displayed data. Level 단위: mm (millimeter), cm (centimeter), m (meter), ft (feet), in (inch), yd (yard)
SENSOR1 Level	Displays the measured water level value of Sensor Channel 1.
SENSOR2 Level	Displays the measured water level value of Sensor Channel 2.
SENSOR1- SENSOR2 Level	Displays the difference between the water level measurement of Sensor Channel 1 and Sensor Channel 2.
SENSOR 2- SENSOR 1 Level	Displays the difference between the water level measurement of Sensor Channel 2 and Sensor Channel 1.
SENSOR 1 Volume	Displays the calculated tank volume value of Sensor Channel 1.
SENSOR 2 Volume	Displays the calculated tank volume value of Sensor Channel 2.
SENSOR 1 Temperature	Displays the temperature of Sensor Channel 1.
SENSOR 2 Temperature	Displays the temperature of Sensor Channel 2.

DATA End	\n\r(Line feed(0x12),carriage return(0x1)

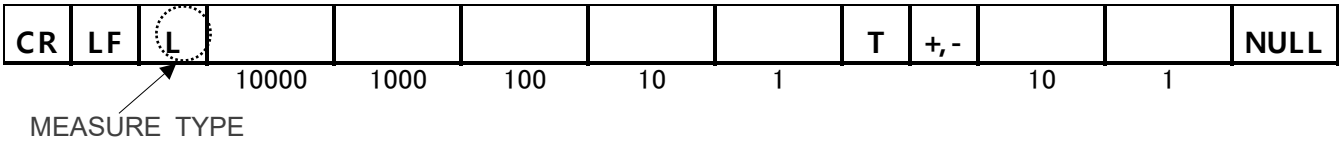
2. BKCM Protocol

2.1 Output Data

SENSOR 1 MEASURE TYPE Data: Transmits the selected data of SENSOR 1 in mm units.

2.2 Output Data Format

The data is output in ASCII code format, and the data transmission sequence is as follows:



MEASURE TYPE

Displayed as abbreviations for the settings and their corresponding numerical values.

L: LEVEL	**D**: DISTANCE	**S**: SPACE	**E**: ERROR

3. Modbus

The RLM7000 supports two modes: Modbus RTU and Modbus ASCII.
All registers are read-only (Read Holding Registers only) and do not support write operations.
The Modbus ID can be set from 1 to 247. (SYSTEM SETUP->SYSTEM ID->Modbus ID)

Type	Description	Start Register		Register Offset		Registers	Data Description		R/W
		Hex	Decimal	Hex	Decimal				
ID	Product code	8001	32769	8000	32768	1	0 = Level(RLM7000) 10 = Flow(SNC100F) 20 = Reserved		R
Unit	Measurement Unit(Level)	8002	32770	8001	32769	1	1 = Meter 2 = Millimeter 3 = Centimeter 4 = feet 5 = inch 6 = yard		R
	Temperature Unit	8004	32772	8003	32771	1	0 = ℃ (Reserved) 1 = ℉ (Reserved)		R
Data	Distance1	8011	32785	8010	32784	2	Sensor1 Distance	float	R
	Level1	8013	32787	8012	32786	2	Sensor1 level	float	R
	Space1	8015	32789	8014	32788	2	Sensor1 space	float	R
	Volume1	8017	32791	8016	32790	2	Sensor1 volume	float	R
	Distance2	8019	32793	8018	32792	2	Sensor2 Distance	float	R
	Level2	801B	32795	801A	32794	2	Sensor2 level	float	R
Data	Space2	801D	32797	801C	32796	2	Sensor2 space	float	R
	Volume2	801F	32799	801E	32798	2	Sensor2 volume	float	R
	Temp 1(inside)	802B	32811	802A	32810	2	Reserved	float	R
	Temp 2(inside)	802D	32813	802C	32812	2	Reserved	float	R
	Temp (outside)	802F	32815	802E	32814	2	Reserved	float	R
Relay	Relay control status	8031	32817	8030	32816	1	Bit Mapped 0bxxxx xxx0 / (0x00) Relay 1 Off 0bxxxx xxx1 / (0x01) Relay 1 On 0bxxxx xx0x / (0x00) Relay 2 Off 0bxxxx xx1x / (0x02) Relay 2 On 0bxxxx x0xx / (0x00) Relay 3 Off 0bxxxx x1xx / (0x04) Relay 3 On 0bxxxx 0xxx / (0x00) Relay 4 Off 0bxxxx 1xxx / (0x08) Relay 4 On 0bxxx0 xxxx / (0x00) Relay 5 Off 0bxxx1 xxxx / (0x10) Relay 5 On 0bxx0x xxxx / (0x00) Relay 6 Off 0bxx1x xxxx / (0x20) Relay 6 On		R

<Modbus Register Table>

Reserved items output as NULL.

3.1 Request PDU Example

(1) Product code Request

Function Code	Data Request	
	Register Offset	Quantity
0 X 03	0 X 8000	0 X 0001

(2) Distance, Level, Space, Volume Request

Function Code	Data Request	
	Register Offset	Quantity
0 X 03	0 X 8000	0 X 0002
0 X 03	0 X 8012	0 X 0002
0 X 03	0 X 8014	0 X 0002
0 X 03	0 X 8016	0 X 0002

3.2 Modbus Register Data type

- Data field: 4byte float type
- ID, UNIT, Relay field: Unsigned short(2byte) type

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