RFM8000
RADAR FLOW METER
User's Manual



August 2025

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1.0 About the RFM8000 Manual

This manual provides important information on the installation, wiring, operation, and usage of the RFM8000 and its dedicated sensor. Please make sure to read this manual thoroughly before installing or operating the product. As this manual is essential for the proper use of the product, please keep it in a safe place for future reference.

- This manual is provided in electronic format along with the product at the time of purchase. It is also available for download at any time from our official website.
- Please note that the contents of this manual are subject to change without prior notice if the product is revised or upgraded to improve its functionality.
- Although this manual is regularly reviewed and updated, errors may still be found. If you discover any mistakes, please contact our service center. We will make sure to reflect your feedback in the next version.

1.1 Safety Instructions

01 User	Installation and operation of the product must be carried out by a certified professional or an individual with equivalent qualifications. Always wear appropriate personal protective equipment (PPE) when handling or operating the product.
02 Product Operation	The manufacturer assumes no responsibility for any accidents resulting from failure to follow the installation instructions in this manual, unauthorized modifications to the product, or user negligence. For optimal performance and safety, ensure regular maintenance and periodic inspections are performed.
03 Cautions	Please adhere strictly to the cautionary notes provided in this manual. The manufacturer will not be held liable for any accidents or hazards resulting from failure to observe these precautions.
04 Product	After opening the product packaging, carefully inspect the product and included accessories for any damage or contamination. Damaged products may not function properly.

1.2 Symbols Used in This Manual

Symbol	Description
 Caution	Failure to follow the precautions may result in the device not operating properly.
 Warning	Failure to follow the warnings may result in personal injury or damage to the device.
 Electrical Hazard	Be cautious during wiring work, as there is a risk of electric shock due to high voltage.
 Information	Provides information about the relevant page.

2. Product Description

The RFM8000 is a radar open-channel flow meter designed to measure flow rates in open channels. It calculates the flow rate based on the water level measured at specific weirs or flumes, using pre-defined flow conversion formulas. Therefore, accurate water level measurement is essential for precise flow calculation.

The RFM8000 not only measures water level accurately with a high-precision sensor, but also supports various flow formulas for different types of weirs and flumes, allowing flexible application depending on the user's environment. Additionally, measured flow data is stored in ample internal memory and can be conveniently downloaded via USB, making it efficient for analyzing flow trends.

Applicable Environment	• Hydraulic facilities such as water purification plants and wastewater treatment plants • Tanks for storing water, liquids, or chemicals • Rivers, channels, and other open waterways

Caution

Depending on the material of the installed sensor, the measurement range may be limited. When measuring chemicals, please consult the distributor or sales representative in advance.

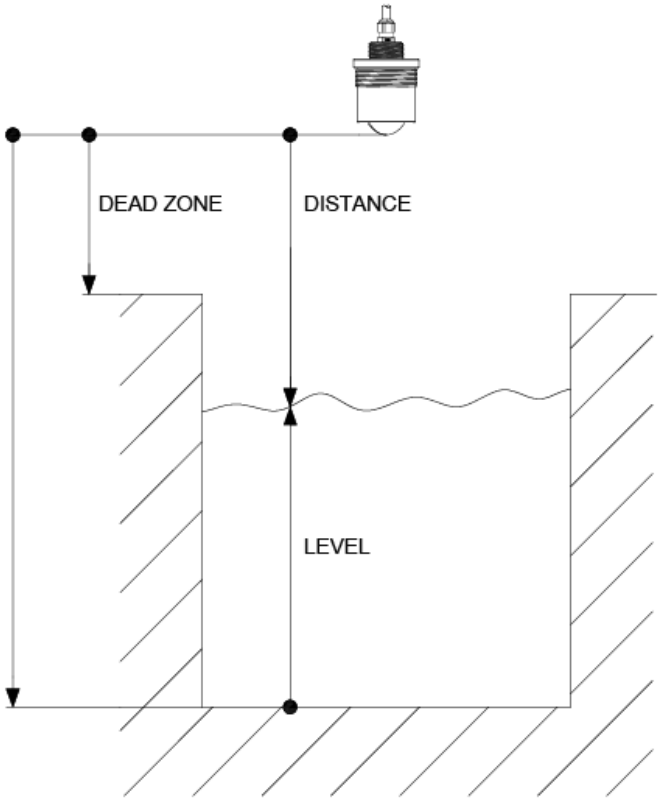
2.1 Measurement Principle

The RFM8000 measures the time it takes for radar pulses emitted from the radar sensor to reflect off the surface of the target material and return. This time is then converted into distance to determine the water level or volume. Based on this water level, the device automatically calculates and displays the current flow rate or the accumulated flow rate using flow-rate conversion formulas.

Dead Zone:
The undetectable area directly below the sensor where accurate measurement is not possible.

Level:
The distance from the bottom of the channel or tank to the surface of the measured substance.

Empty:
The distance from the sensor to the bottom of the channel or tank (i.e., the full empty span without any substance).



2.2 Product Specifications

2.2.1 Controller

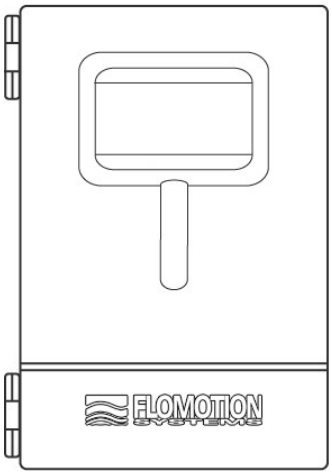
Measurement Method		Non-contact radar pulse reflection method
Accuracy		0.1% of F.S
Resolution		1mm
Response Speed		0.1mm/min ~100m/min (Selectable)
Data Logging		16 or 128 logs (up to 672 days at 1 log/hour)
Output	**Analog**	4~20mA into max 750Ω
	Relay	3 relays
	Digital	RS-232(485), Modbus
Display		Graphic LCD
Protection		IP65
Operating Temperature		-4°F to 140°F Max. relative humidity 80%
Material		Polycarbonate
Dimension		6.5 (W) X 9.8 (H) X 3.7 (D) in.
Weight		About 4.4 lbs
Power Supply		100-230V AC±15%, 50/60Hz, 29VA(12W) Fuse: 250V T1.0A
Location		Indoor/Outdoor
Altitude		6500 ft max

2.2.2 SR50 Sensor

Measuring Range	8 in. to 50 ft.
Frequency	60GHz
Beam Angle	10° at -6dB
Mounting Standard	1-inch & 2-inch NPT
Weight	3.3 lbs
Sensor Material	PVDF, PP
Operating Temperature	-22°F to 158°F Max. relative humidity 90%
Protection Rate	IP68
Cable	3-core shielded cable (AWG20), extendable up to 980 ft
Certification	FCC, CE, UL

2.3 Package Contents

The RFM8000 measures water level in combination with the SR50 sensor, which is a dedicated radar level sensor. The controller and sensor are packaged separately. The RFM8000 package includes the following components:



Controller Body



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

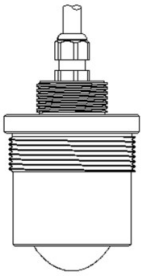


USB Connector (Option)

Caution

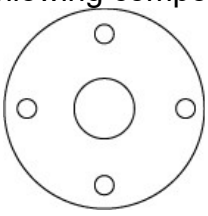
The RFM8000 controller complies with the IP65 waterproof rating.
For ease of installation, the bottom surface is pre-fitted with five gland holes and three cable glands at the time of shipment.

The SR50, a dedicated level sensor, includes the following components:

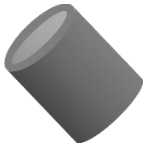


Radar Sensor (SR50)

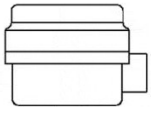
(Standard cable length: 10 m)



Flange (option)



1" Adapter (option)

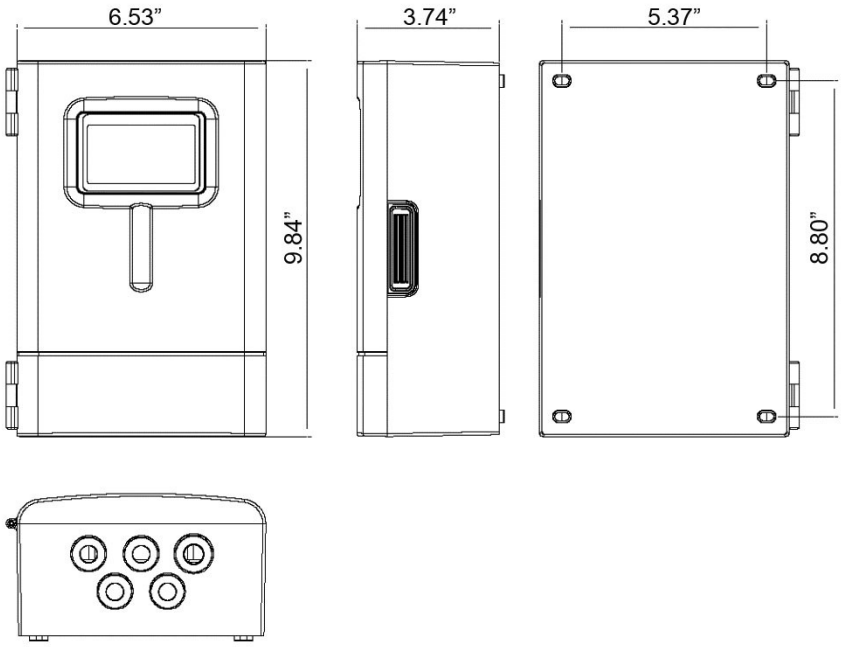


Head (option)

2.4 Product Dimensions

2.4.1 Controller

The RFM8000 controller is made of polycarbonate material and has a waterproof rating of IP65. The diagram below shows the external dimensions of the product. The unit can be installed as a wall-mounted type using the mounting holes on the back of the enclosure.



2.4.2 Sensor

The SR50 radar sensor is a dedicated sensor designed to be used with the RFM8000 controller. It is designed for mounting using the threaded connection at the top of the sensor, which allows for secure installation with a compatible PVC socket or direct mounting to a flange.



3. Installation

3.1 Installation and Commissioning Precautions



Caution

Before installation, be sure to check the manual and specifications to verify that the product is suitable for the intended installation environment. Failure to do so may result in improper operation of the product.

The following are general precautions to consider when installing radar measuring instruments.

- Remove any obstacles between the sensor and the target material.
- Ensure sufficient distance between the radar beam path and the tank wall or other structures to avoid signal interference.
- Install the radar sensor so that its surface is perpendicular to the target material.
- Make sure the maximum liquid level does not fall within the sensor's dead zone.
- Avoid installation in areas exposed to strong winds or excessive direct sunlight. Strong winds can deflect the radar beam and cause malfunction. If installation in direct sunlight is unavoidable, a sunshade should be used.
- Keep the sensor away from areas with strong electromagnetic noise, such as high voltage or high current sources.
- Do not install the sensor in locations with excessive vibration.



Information

After installing the product according to the instructions in the manual, use the [130] Current Simulation menu and the [237] Relay Simulation menu to verify that the outputs are operating correctly.

3.2 Controller Installation

3.2.1 Installation Location

Please install the RFM8000 controller in a location that meets the following conditions:

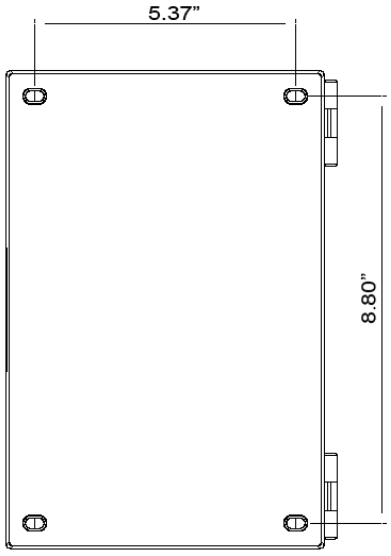
- A place where the ambient temperature can be maintained between -4°F and +140°F
- A location where the cable length between the controller and the radar sensor can be minimized
- A location that allows easy access for commissioning and checking the operating status
- A place protected from direct sunlight
- A location free from vibration
- A place with sufficient clearance to open the controller cover fully



Avoid installing the unit near areas with high voltage or high current, or in close proximity to motors or other controllers.

3.2.2 Installation Method

The installation procedure is as follows:



1. Open the cover of the controller and check the positions of the four mounting holes located at the corners.
2. Drill four pilot holes (⌀3.5 mm) into the wall at the positions indicated. (Refer to the diagram for dimensions.)
3. Align the controller with the drilled holes on the wall.
4. Using four prepared screws (5x12) and a Phillips screwdriver, securely fasten the controller to the wall.

Information

For wiring information related to the controller terminal block, please refer to page 18.

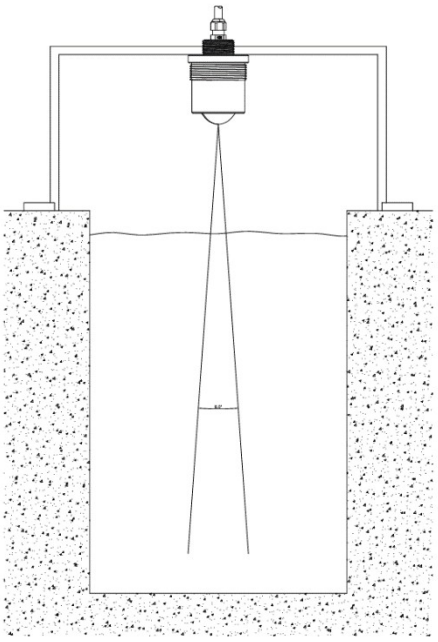
3.3 Sensor Installation

3.3.1 Sensor Location

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

- Ambient temperature is between -22°F and +158°F
- Pressure tank operates within the range of 13 to 29 PSI
- Area protected from direct sunlight

3.3.2 Installation Method



The detection range of the radar sensor is determined by the intensity of the radar signal emitted from the sensor and is closely related to the sensor's directivity. Typically, the signal strength is highest at the center and gradually decreases as the angle widens. The standard detection range is defined as the angle at which the signal decreases by -6 dB from the center axis, which is approximately 10°.

The SR50 level sensor used in the RFM8000 has a dead zone of 7.9". Since the dead zone is an area where measurement is not possible due to the nature of radar signals, it must be taken into account during installation.

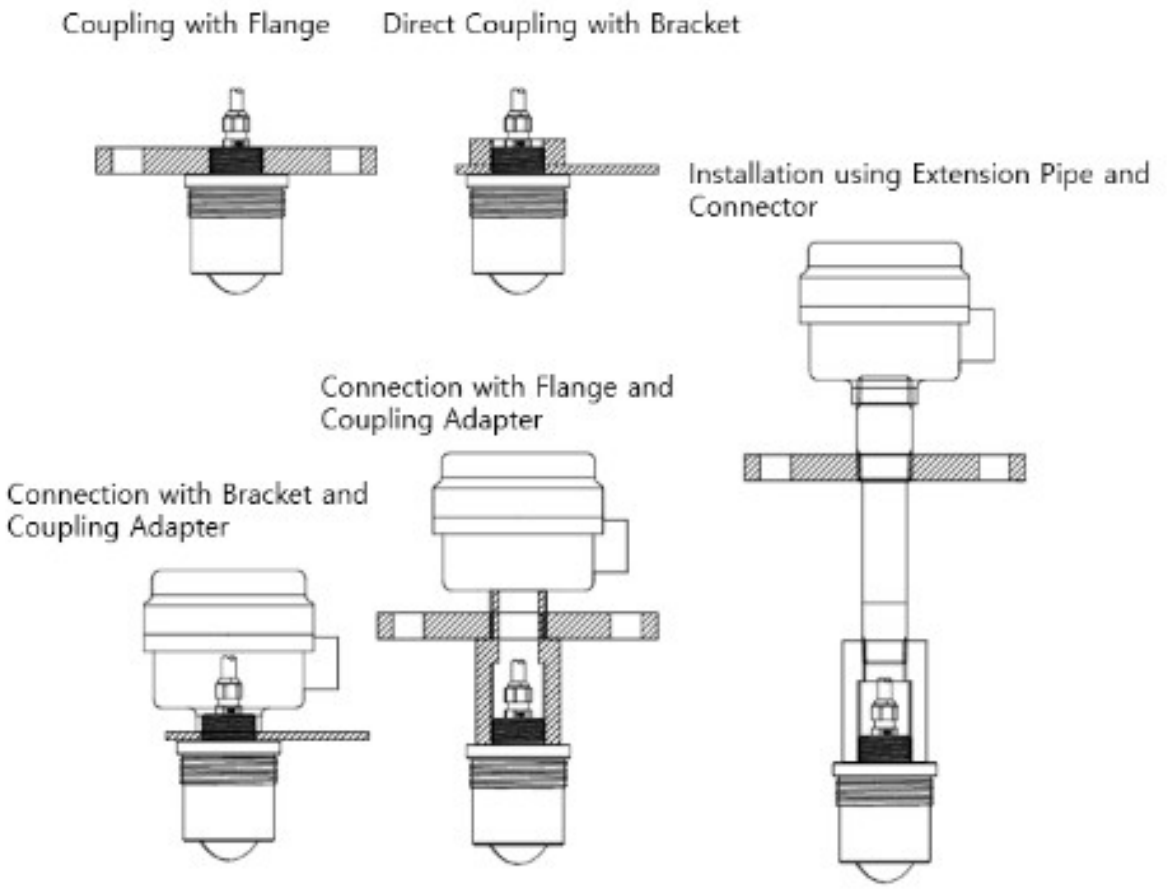
Information

In installation environments where signal attenuation may occur due to installation location, measuring distance, or the characteristics of the target material, additional configuration may be required.

When installing the radar sensor, make sure there are no obstacles within the radar beam angle range, as shown in the illustration above, that may interfere with the radar signal path.

Measuring Distance (Unit : feet)	Clearance Distance (Unit : inches)
3.3	3.1
6.6	6.7
9.8	10.2
13.1	13.8
16.4	17.3
19.7	20.5
23.0	24.0
26.2	27.6
29.5	31.1
32.8	34.3

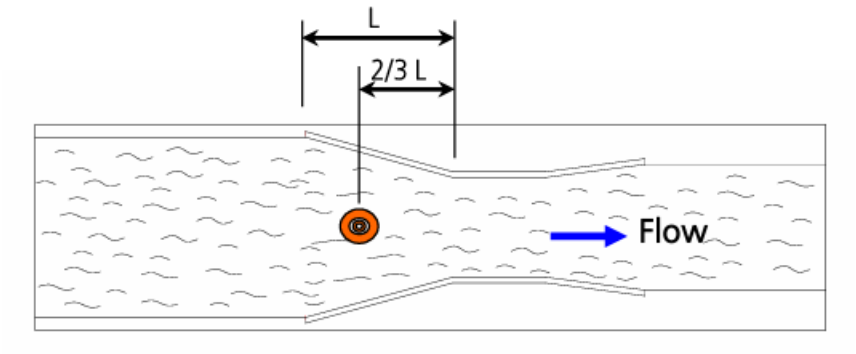
The radar sensor can also be installed in combination with various components such as flanges, sensor adapters, connection terminals, and metal pipes, as shown in the illustration below.



3.4 Installation Guidelines by Type of Open Channel

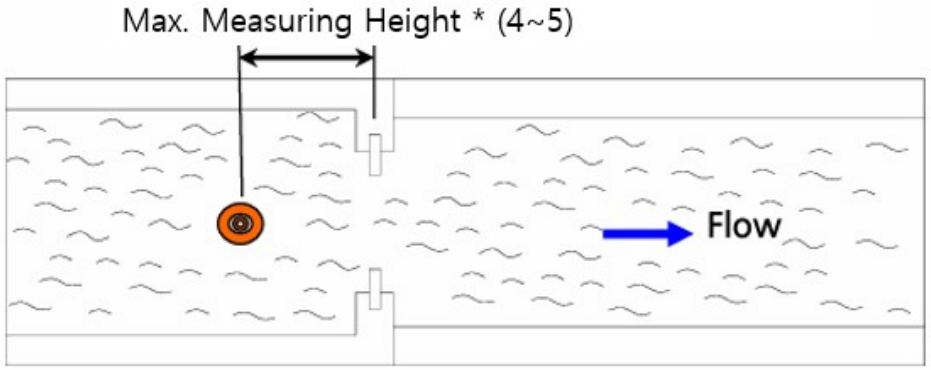
3.4.1 Parshall Flume

In a Parshall flume, the sensor should be installed at a point located two-thirds of the way along the converging section.



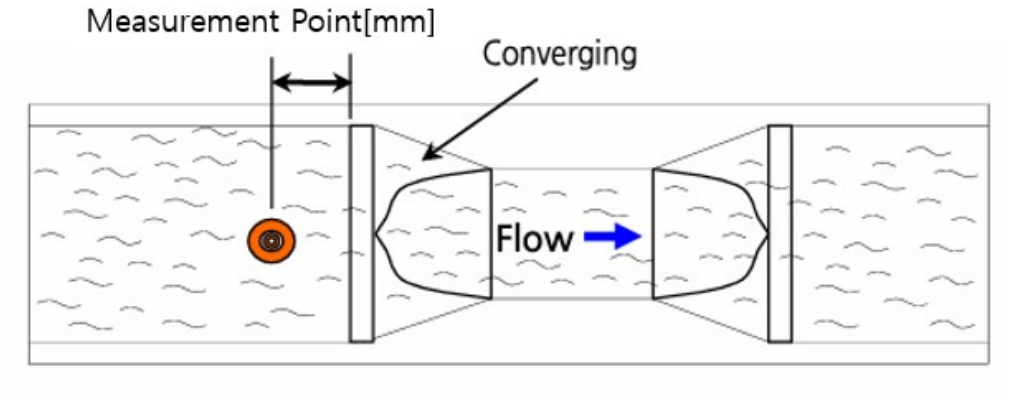
3.4.2 Rectangular, V-notch, and Cipoletti Weirs

For rectangular, V-notch, and Cipoletti weirs, the sensor should be installed at a point located upstream from the drop point at a distance of 4 to 5 times the maximum water height in the channel.



3.4.3Leopold Lagco Flume

For the Leopold-Lagco flume, the sensor should be installed at a point along the top of the converging section, at a distance determined by the channel size.



For detailed information, please refer to the following table.

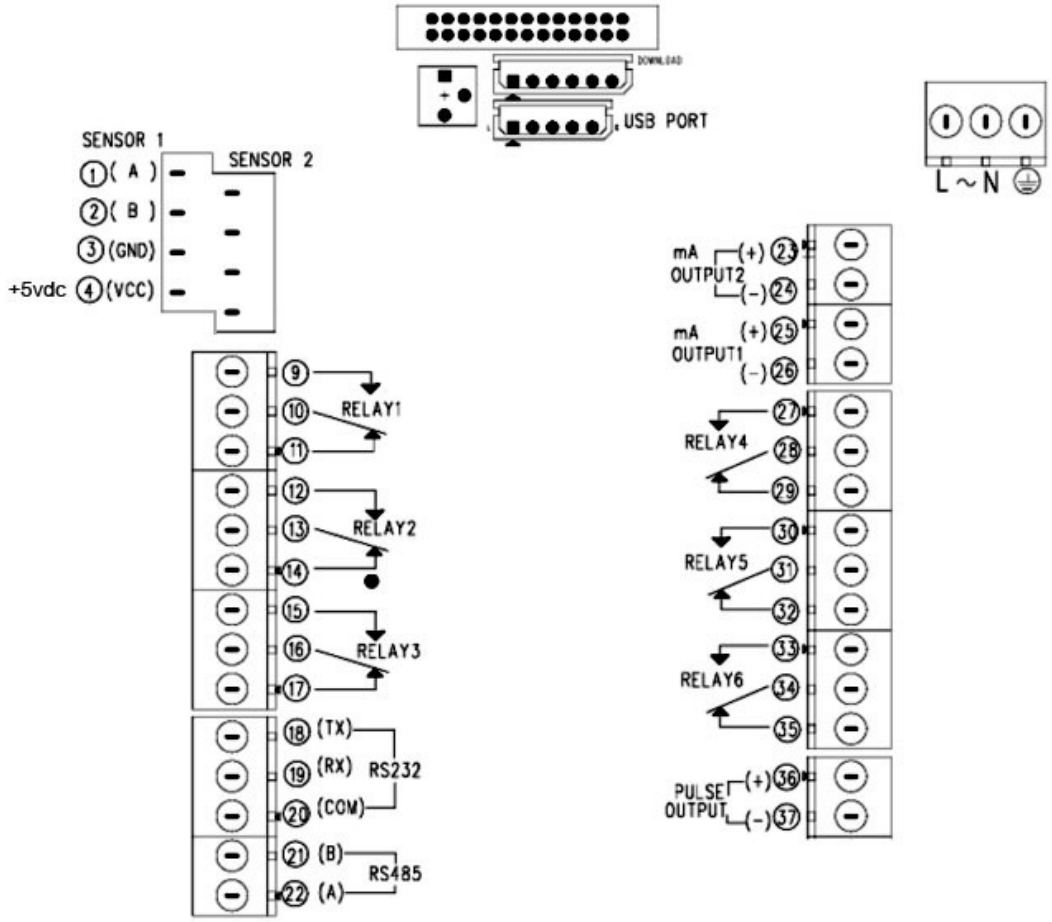
Channel Length		Measurement Point	
mm	inches	mm	inches
100~	4~12	25	1.0
380	15	32	1.3
455	18	38	1.5
530	21	44	1.8
610	24	51	2.1
760	30	64	2.5

4. Wiring

4.1 Wiring Information

4.1.1Terminal Block

When you open the controller cover, the terminal blocks are arranged in a row as shown in the figure below.



4.1.2 Wiring Method

- Loosen the screw at the top of the terminal block.
- Insert the cable lug deeply into the terminal, then tighten the screw by turning it clockwise.
- Be careful not to apply excessive force, as this may damage the terminal block.
- The ground terminal must be connected to the power ground wire.

When extending the cable on-site, it is recommended to use a 3-core shielded cable with a specification of AWG20 or higher.

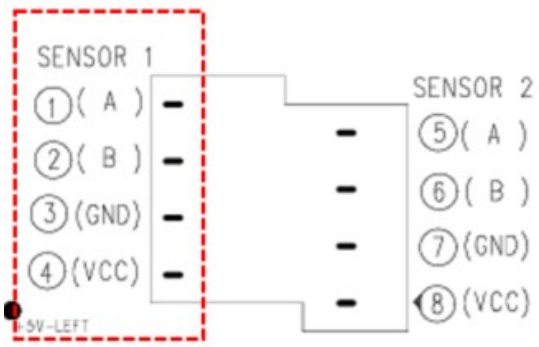
Electrical Hazard

Power supply must be turned off during wiring work.

Information

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

4.1.3Sensor



The SENSOR2 terminal on the RFM8000 cannot be used.

After stripping the insulation from the provided sensor cable, connect the four-core sensor cable to the terminal block according to the color labels printed on the terminal.

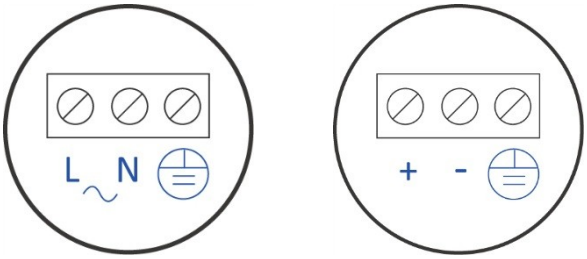
When inserting the sensor cable lugs into the terminal block and tightening the bolts, be careful not to apply excessive force.

Electrical Hazard

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

4.1.4Power

The RFM8000 is equipped with an AC power terminal as standard, and a DC power terminal is available as an option.



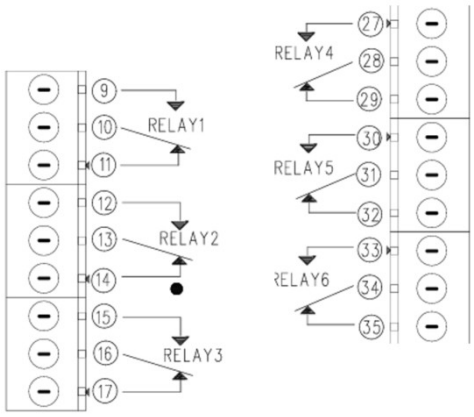
AC Power Terminal DC Power Terminal

Warning	When installing the product for the first time, please temporarily deactivate any related alarm or warning systems nearby. Once commissioning is complete and the device is confirmed to be operating normally, reactivate the alarm and warning systems.
Electrical Hazard	The RFM8000 is equipped with an internal fuse for overcurrent protection. When connecting AC power, install a 10A circuit breaker to protect the device. The breaker switch should be installed in a location near the product for easy access in case of emergency.

Relay

The relays provided in the RFM8000 are of the TWO FORM C type, and can be used with both NO (Normally Open) and NC (Normally Closed) connections. By default, 3 relays are provided, and up to 6 relays can be used as an option.

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

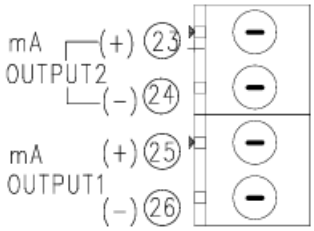


Analog Output

The mA OUTPUT1 terminal provides the analog output (4–20mA) corresponding to measurements from Sensor 1.

The mA OUTPUT2 terminal is designated for Sensor 2, but it is not available for use on the RFM8000.

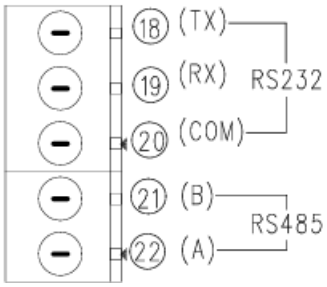
Please use only mA OUTPUT1 for analog signal output.



Digital Output

This terminal is for digital output.

The default configuration is RS232, and the output mode can be changed via optional settings.



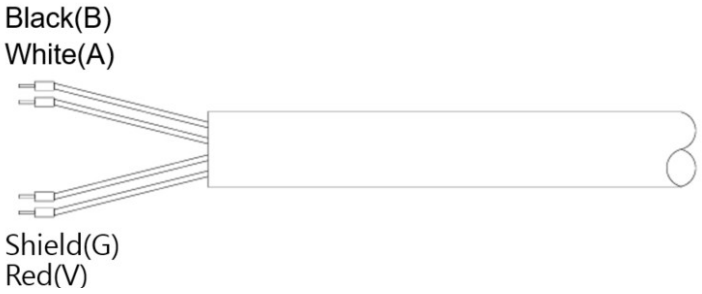
4.2 Sensor Cable

The SR50 Series radar sensor uses a 3-core shielded cable. A 33ft sensor cable is provided as standard upon shipment. If a longer cable is required it can be extended.

It is recommended to use the supplied cable at its full original length. If cutting is unavoidable, the shield should be stripped minimally, and the lugs must be securely connected. When extending the cable, be sure to use the same type of cable. The shielded section at the connection point must be properly maintained using metal mesh or metal tape, followed by insulation tape wrapping. Waterproofing treatment is necessary if the connection may be exposed to rain or moisture.

When working with the sensor cable, it is recommended to use grounded conduits and terminal connectors.

For orders with the standard 33ft cable, the cable is shipped without end processing. When extending the cable on-site, it is recommended to use a 3-core shielded cable with a specification of AWG20 or higher.



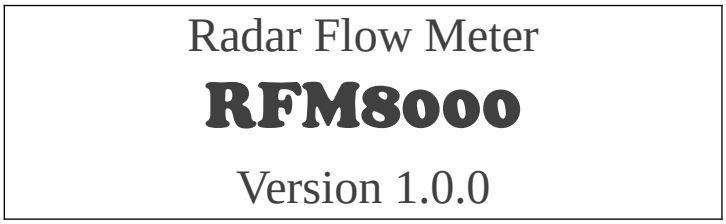


- Do not use coaxial or non-standard cables. Please note that the manufacturer is not responsible for any product malfunction or failure caused by extension work using non-standard cables.
- To prevent noise interference, sensor cables must not be installed parallel to high-voltage or power lines.
- Sensor cables must not be installed near inverters.

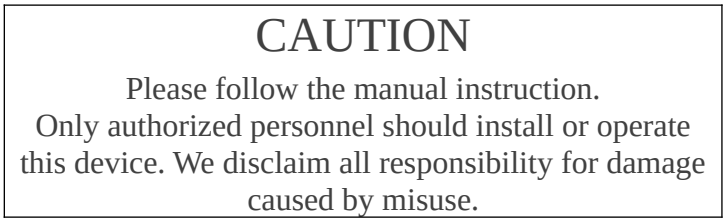
5. Operation

5.1 Startup Screen

When power is supplied, the product name screen and warning message screen are displayed as shown below.



Product Name and Version Display Screen



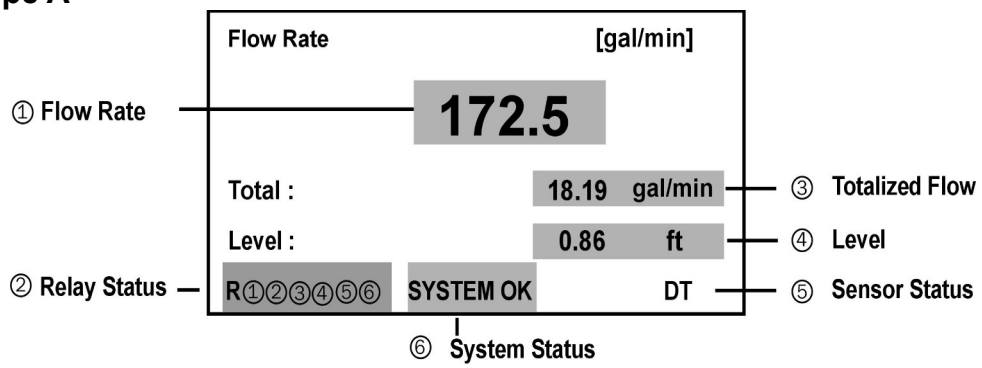
Caution Screen

5.2 Display

5.2.1Measurement Display Modes

There are two types of measurement display modes: Screen A and Screen B.
Press the [Up]/[Down] buttons to switch between the two screens sequentially.

Display Type A

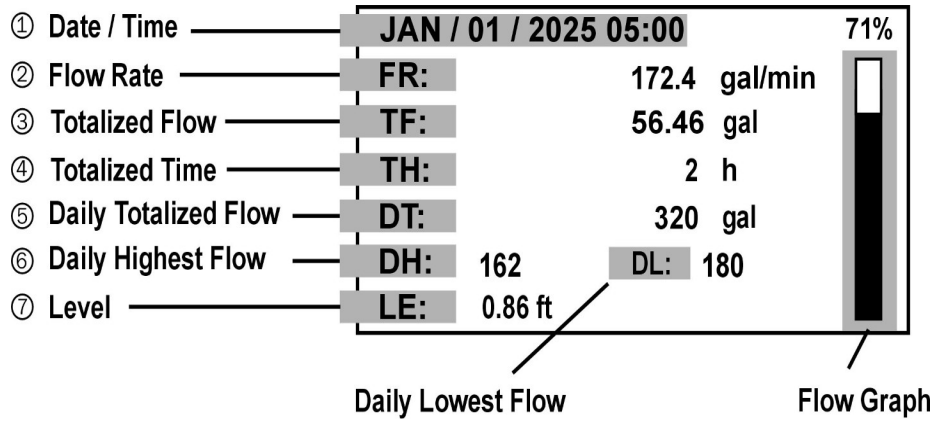


The currently measured area type is displayed, and the following items are shown on the screen.

①Instantaneous Flow Rate	• Displays the current instantaneous flow rate. Units can be selected from: m3/h, m3/d, l/min, ft³/s, UK GPM, US GPM, UK MGD, US MGD.
②Relay Status	• Indicates the status of the relay. The icon is only displayed when the relay is set to ON. If the relay is not configured (OFF state), this item will not be shown on the screen.
③Totalized Flow	• Displays the accumulated flow rate from the set starting point up to the current time.
④Level	• Indicates the measured water level from the bottom surface of the measurement object to the water surface.
⑤Sensor Status	• Indicates the current sensor status, shown depending on the operating condition: • DT: Normal operation • D: Receiving reflected wave • S1: Measured value out of damping speed range (measurement held) • S2: Re-scanning • LE: Lost echo
⑥System Status	• SYSTEM OK: Displayed when the system is operating normally • SEN OPEN: Sensor not connected or disconnected • FAIL: Unable to measure flow

Display Type B

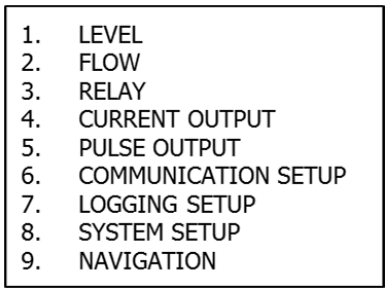
The following information is displayed in Screen Type B.



①Date/Time	• Displays the current date and time.
②Flow Rate	• Displays the current instantaneous flow rate.
③Totalized Flow	• Displays the total accumulated flow from the set start time to the present.
④Totalized time	• Displays the total accumulated time from the set start time to the present.
⑤Daily Totalized Flow	• Displays the total accumulated flow for the current day.
⑥Daily Highest Flow	• Displays the maximum instantaneous flow measured during the current day.
⑦Level	• Displays the measured level from the bottom of the channel to the water surface.
⑧Daily Lowest Flow	• Displays the minimum instantaneous flow measured during the current day.
⑨Flow Graph	• Displays a graph showing the current flow rate as a ratio of the maximum flow.

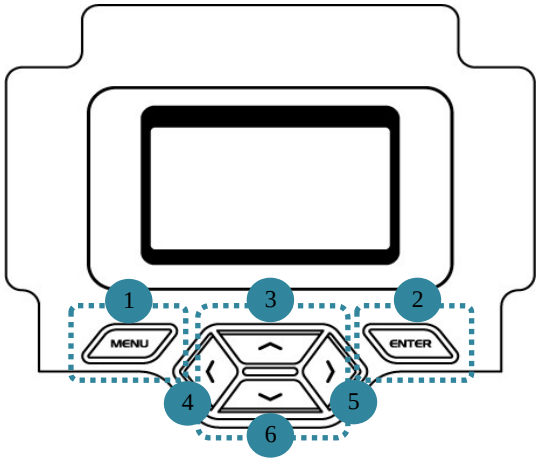
5.2.2Setting Mode

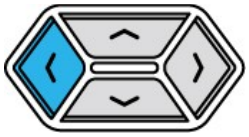
When the [MENU] button is pressed in the measurement screen mode, the system switches to the setting screen mode, and the following items are displayed.



Item	Description
LEVEL	This menu is for configuring LEVEL settings.
FLOW	This menu is for configuring FLOW settings.
RELAY	This menu is for configuring RELAY settings.
CURRENT OUTPUT	This menu is for configuring current output settings.
PULSE OUTPUT	This menu is for configuring pulse output settings.
COMMUNICATION SETUP	This menu is for configuring communication settings.
LOGGING SETUP	This menu is for configuring logging-related settings, such as logging intervals.
SYSTEM SETUP	This menu is for configuring system settings.
NAVIGATION	This menu allows direct access to a specific menu by entering its assigned number.

5.3 Operation Buttons

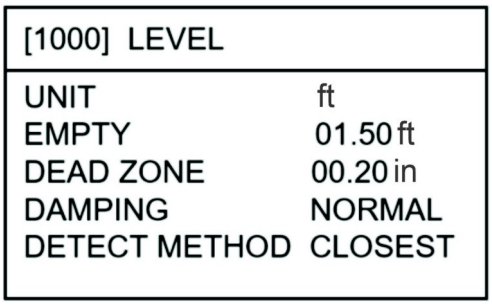


1		• Press the [MENU] button in measurement mode to enter the setting mode. • • Press the [MENU] button again in setting mode to return to the measurement mode.
		• Press this button in Setup Mode selects the highlighted menu.
		• Move the menu item upward or change the setting value. • Holding the button down while entering a value will increase the change speed.
		• Move the menu item downward or change the setting value. • Holding the button down while entering a value will increase the change speed.
		• Move from a sub-menu to a higher-level menu. • Used to change digit positions in the setting screen mode.
		• Move to a sub-menu or enter the value setting mode in the menu screen (Performs the same function as the ENTER button) • In the setting screen mode, used to change digit positions

6. Setting Menu

6.1 LEVEL

QUICK SETUP is a user-friendly feature that groups frequently used parameters for setting up the level meter. It allows for quick and easy configuration of essential settings.



UNIT

This menu allows you to select the unit for the measured values.
Available measurement units: mm, cm, m, in, yd, ft.

EMPTY

This is a menu for setting the distance from the radar sensor to the bottom.

The input unit varies depending on the selected UNIT.

Sensor	maximum configurable range	factory default setting
SR50	7.9in – 50.00ft	16.4ft

DEAD ZONE

This menu is used to set the dead zone distance from the sensor.
Radar sensors use a transceiver-type design, which means they cannot measure distances within a certain range from the sensor surface.

This un-measurable range is referred to as the dead zone.

Sensor	maximum configurable range	factory default setting
SR50	7.9in – 16.4ft	7.9in

DAMPING

This setting determines the response speed of the output in relation to changes in the water level.

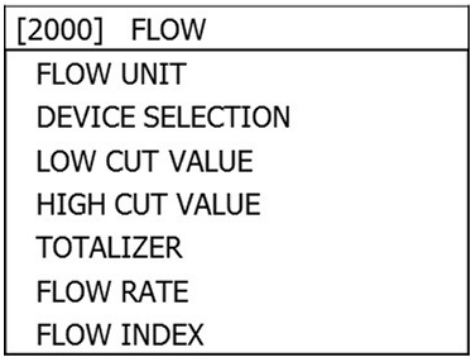
Sensor	maximum configurable range	factory default setting
SR50	SLOW, NORMAL, FAST, VFAST	NORMAL

DETECT METHOD

You can select a valid level signal based on nearby obstacles and the strength of the signal.

- Closest: Uses the first received signal as the level value.
- Strongest: Among multiple reflected signals, selects the strongest signal as the level value.

6.2 FLOW



6.2.1 FLOW UNIT

This is the menu where you can select the Flow Rate unit. Available Flow Rate units are shown in the table below. The Total Flow (Volume) unit is automatically set based on the selected Flow Rate unit, as shown in the table.

Flow Rate	Total Flow
m^3/h	m^3
m^3/d	m^3
l/min	KL(Killo Liter)
ft^3/s	ft^3
GPM[US]	gal[US]
GPM[UK]	gal[UK]
MGD[US]	MG[US]
MGD[US]	MG[UK]

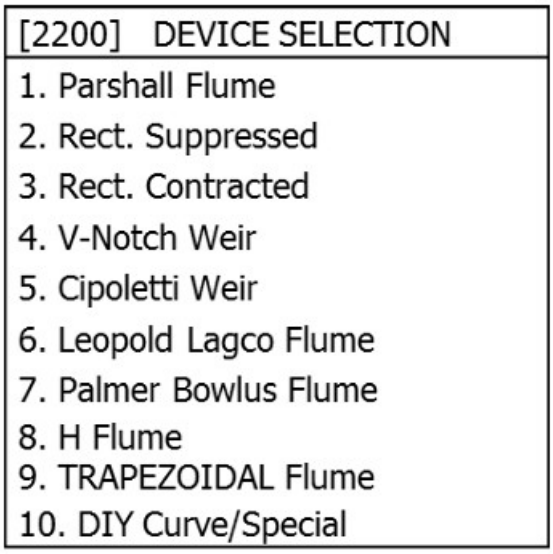
6.2.2 DEVICESELECTION

This is the menu for selecting the type of flume and configuring its detailed parameters. Based on the selected flume type and size, the maximum measurable peak flow rate of the device will be automatically set.

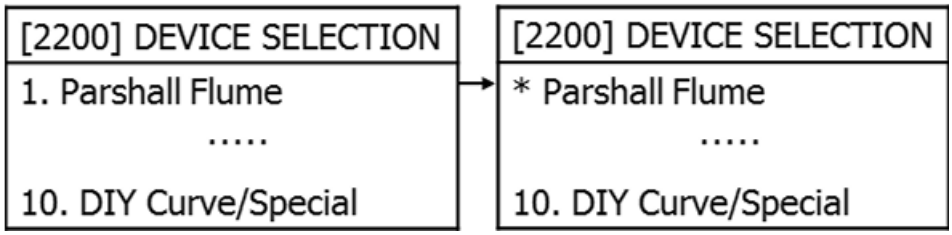


Caution

Each flume type has a different maximum measurable value, so the Device Selection must always be configured first. When changing the type of flume, the previously set maximum values for parameters such as analog output, relay, etc., will be automatically adjusted. Therefore, please exercise caution when making changes to the flume type.

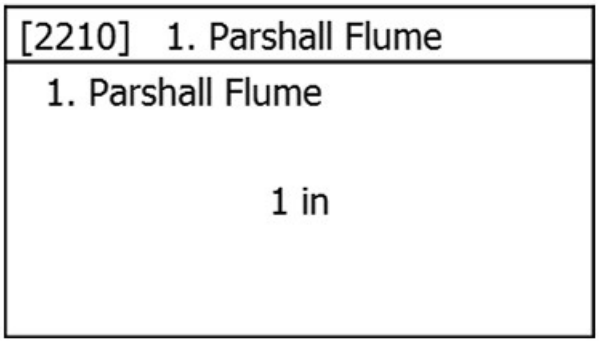


The selected flume will be displayed with an asterisk (*) symbol instead of a number.



(1) Parshall Flume

After entering the settings screen, you can select the specifications of the Parshall Flume using the [Up/Down] arrow keys.

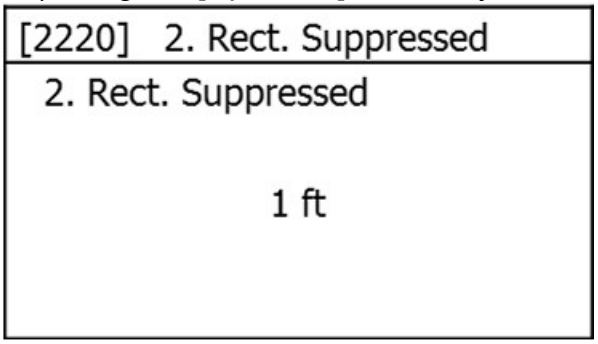


The maximum measurable height for each flume specification is automatically set, and the maximum height is as follows.

Parshall Flume size (in)	Max Height (in)	Parshall Flume size (ft)	Max Height (in)
1	7.1	1	30
2	7.1	1.5	30
3	17.7	2	30
6	17.7	3	30
9	23.6	4	30
		5	30
		6	30
		8	30
		10	41.7
		12	53.9

(2) Rect. Suppressed

After entering the settings screen, you can select the specifications of the Rect. Suppressed Weir (full-width rectangular flume) using the [Up/Down] arrow keys.

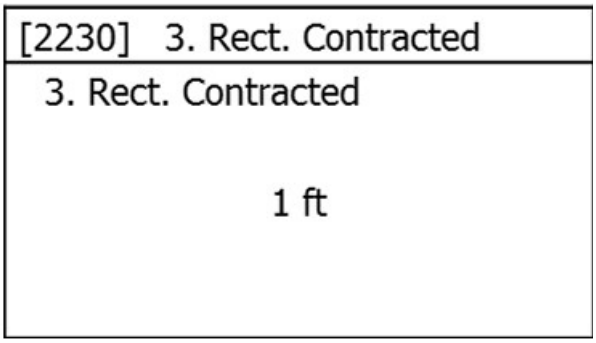


The maximum measurable height for each flume specification is automatically set, and the maximum height is as follows.

Rectangular Suppressed (ft)	Max Height (in)	Rectangular Suppressed (ft)	Max Height (in)
1	5.9	4	23.6
1.5	8.7	5	29.5
2	11.8	6	35.4
2.5	14.6	8	47.2
3	17.7	10	59.1

(3) Rect. Contracted

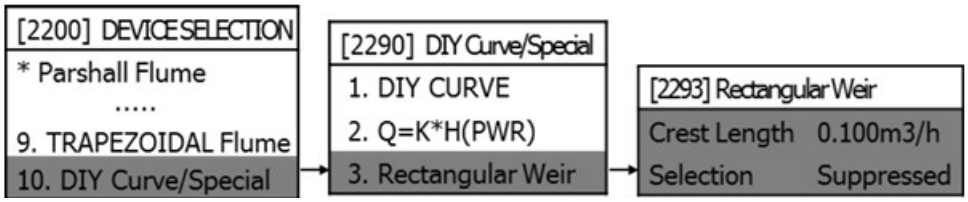
After entering the settings screen, you can select the specifications of the Rect. Contracted Weir (rectangular flume) using the [Up/Down] arrow keys.



The maximum measurable height for each flume specification is automatically set, and the maximum height is as follows.

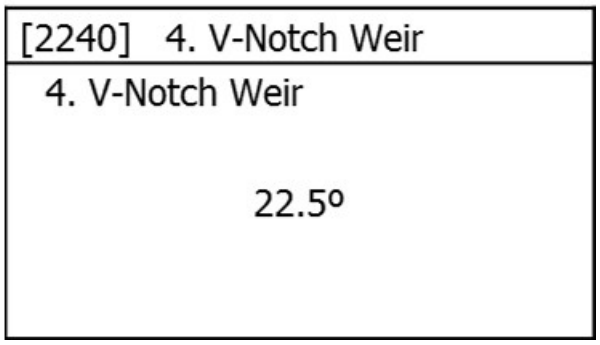
Rectangular Contracted (ft)	Max Height (in)	Rectangular Contracted (ft)	Max Height (in)
1	5.9	4	23.6
1.5	8.7	5	29.5
2	11.8	6	35.4
2.5	14.6	8	47.2
3	17.7	10	59.1

If the flume installed is not in the menu, please proceed as follows: Enter the [2293] Rectangular Weir menu, select Suppressed Weir from the Selection, and then input the corresponding Crest Length.



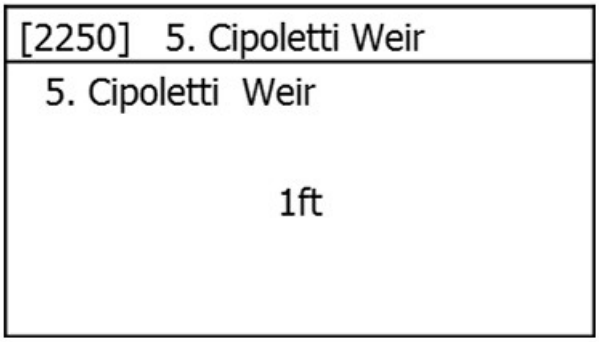
(4) V-Notch Weir

After entering the settings screen, you can select the specifications of the V-Notch Weir (triangular flume) using the [Up/Down] arrow keys. The maximum measurable height is automatically set to 600mm. [Types: 22.5° / 30° / 45° / 60° / 90° / 120°]



(5) Cipoletti Weir

After entering the settings screen, you can select the specifications of the Cipolletti Weir using the [Up/Down] arrow keys.

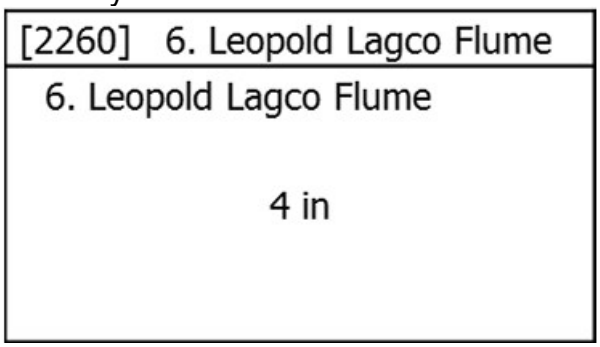


The maximum measurable height is automatically set based on the type and size of the flume, and the maximum height is as follows.

Cipolletti Weir (ft)	Max Height (in)	Cipolletti Weir (ft)	Max Height (in)
1	5.9	4	23.6
1.5	8.7	5	29.5
2	11.8	6	35.4
2.5	14.6	8	47.2
3	17.7	10	59.1

(6) Leopold Lagco Flume

After entering the settings screen, you can select the specifications of the Leopold Lagco Flume using the [Up/Down] arrow keys.



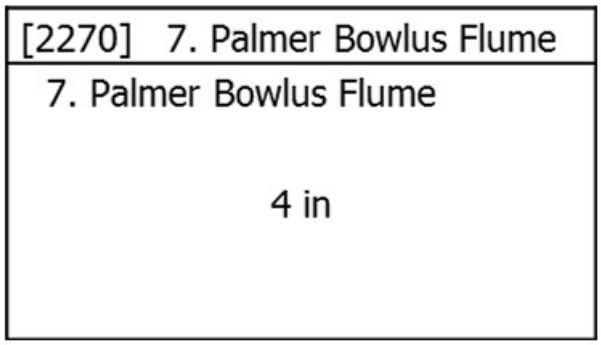
The maximum measurable height is automatically set based on the type and size of the flume, and the maximum height is as follows.

Leopold Lagco Flume (ft)	Max Height (in)	Leopold Lagco Flume (ft)	Max Height (in)

1	2.8	4	10.6
1.5	3.9	5	12.6
2	5.1	6	15.0
2.5	7.1	8	16.5
3	8.3	10	20.9

(7) Palmer Bowlus Flume

After entering the settings screen, you can select the type of Palmer Bowlus Flume using the [Up/Down] arrow keys.

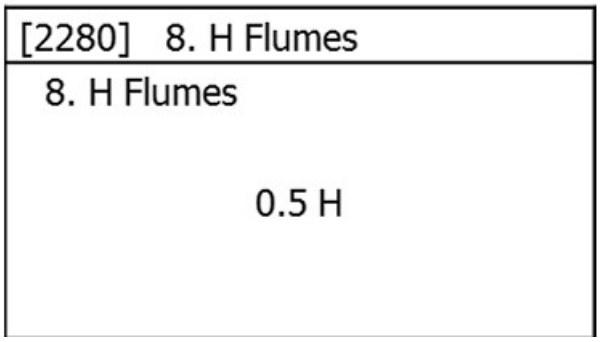


The maximum measurable height is automatically set based on the type and size of the flume, and the maximum height is as follows.

Palmer Bowlus Flume (in)	Max Height (in)	Palmer Bowlus Flume (in)	Max Height (in)
4	3.0	15	10.6
6	4.1	18	12.6
8	5.9	21	15.0
10	7.1	24	16.5
12	8.3	27	19.1

(8) H Flume

After entering the settings screen, you can select the type of H Flume using the [Up/Down] arrow keys.

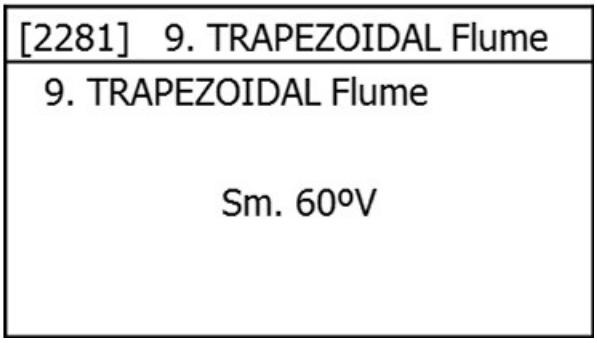


The maximum measurable height is automatically set based on the type and size of the flume, and the maximum height is as follows.

H Flume (ft)	Max Height (in)	H Flume (ft)	Max Height (in)
0.5 H	5.9	4.5 H	53.9
0.75 H	8.7	0.4 HS	4.7
1.0 H	11.8	0.6 HS	7.1
1.5 H	17.7	0.8 HS	9.4
2.0 H	24.0	1.0 HS	11.8
2.5 H	29.9	3.0 HS	35.8
3.0 H	35.8	4.0 HS	48

(9) TRAPEZOIDAL Flume

After entering the settings screen, you can select the type of TRAPEZOIDAL Flume using the [Up/Down] arrow keys.

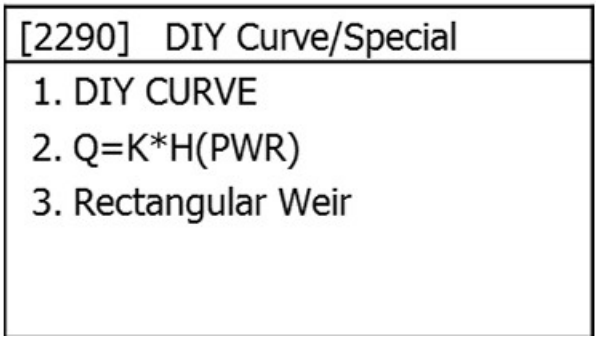


The maximum measurable height is automatically set based on the type and size of the flume, and the maximum height is as follows.

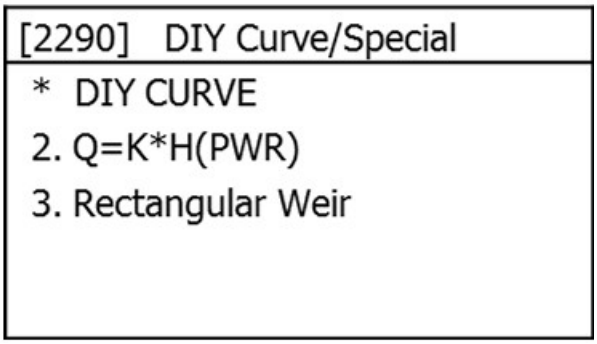
H Flume (ft)	Max Height (in)	H Flume (ft)	Max Height (in)
SM. 60º V	3.5	2" 45º WSC	9.8
LG. 60º V	5.9	12" 45º SRCRC	15.0
XL 60º V	11.2	2.0 ft SRCRC	33.9
3.0 ft 60º V	29.7		

(10) DIY Curve / Special

This menu is used when measuring flow using various methods, regardless of the type of device.

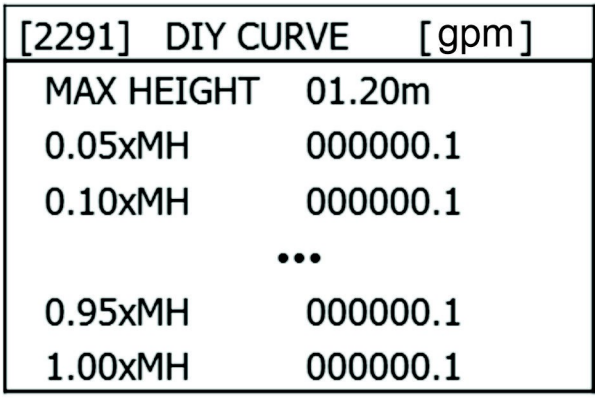


The set items are indicated with an asterisk (*) symbol, as shown in the image below.



DIY Curve

This function allows you to measure the flow rate based on changes in level after dividing the known flow rate per level into 20 parts. The maximum measurement level of the installed device is input using the [Up/Down/Left/Right] arrow keys. After that, you can input the flow values for each height (5%, 10%, ... Max).



(11) Q=K*H(PWR)

This menu allows you to measure the flow rate of a DEVICE that changes exponentially by entering appropriate constants K and PWR to calculate the flow values.

[2292] Q=K*H(PWR)	
K	0000.0001
PWR	0.001
H	ft
Q	gpm

The known or calculated K Constant and PWR Constant are input using the [Up/Down/Left/Right] arrow keys.



The units used for H (head) and Q (flow rate) must be entered accurately.

(12) Rectangular Weir

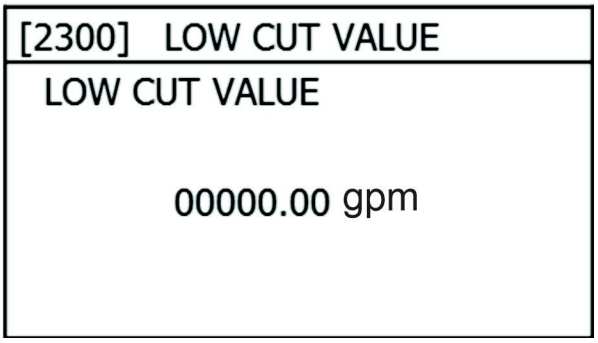
This menu allows you to measure the flow rate by selecting the Crest Length of all Rectangular Weirs in meters (m) or feet (ft) units.

[2293] Rectangular Weir	
Crest Length	2.20ft
Selection	Suppressed

- Crest Length: A menu to set the width of the crest
- Selection: A menu to choose the type of Weir
- Suppressed Weir (Full-width rectangular)
- Contracted Weir (Rectangular)

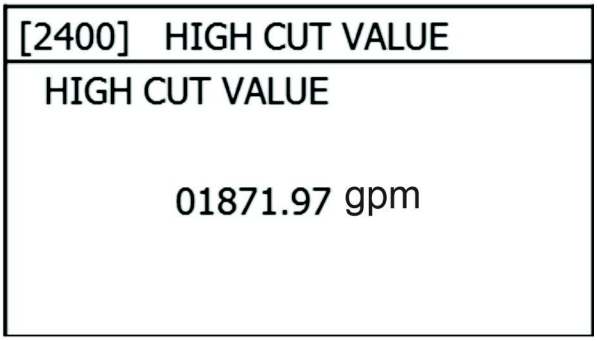
6.2.3 LOW CUT VALUE

This menu is used to set the minimum measurable instantaneous flow rate. Flow rates below the set range are treated as 0. [Setting range: 0.00 to maximum flow rate]



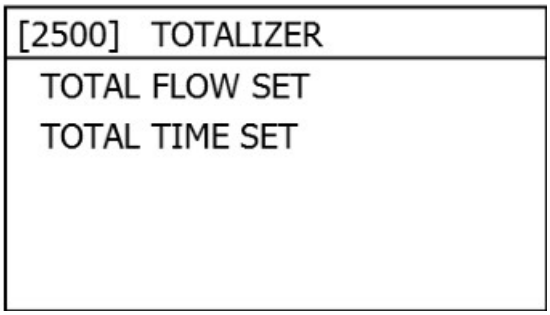
6.2.4 HIGH CUT VALUE

This menu is used to set the maximum measurable instantaneous flow rate, with the default value being the maximum instantaneous flow rate that the device can measure. Flow rates above the set value are treated as the set value. [Setting range: 0.00 to maximum instantaneous flow rate]



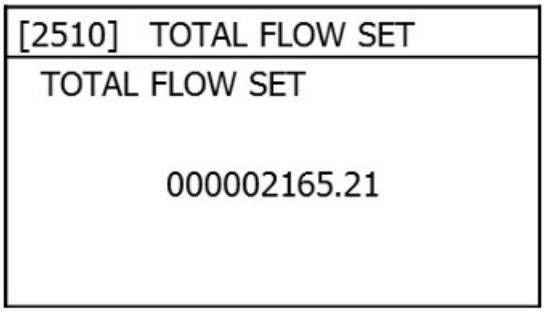
6.2.5 TOTALIZER

This menu allows you to set the initial values totalized flow rate and accumulated time.



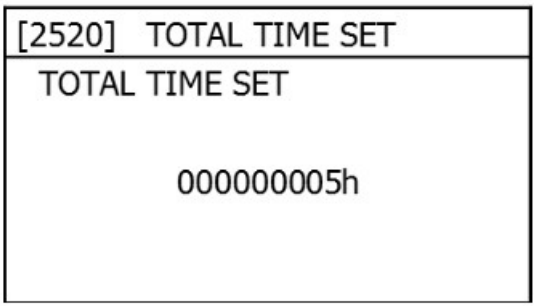
(1) TOTAL FLOW SET

This menu allows you to set the totalized flow rate



(2) TOTAL TIME SET

This menu allows you to set the initial value for accumulated time.



6.2.6 FR RATIO

This menu allows the user to arbitrarily adjust the measured flow rate by a ratio for calibration purposes, such as for weight conversion or error correction.
Display and output method: Measured value x FLOW RATE [Setting range: 0.001 ~ 9.999]

[2600] FR RATIO [gpm]	
FR RATIO	1.000
FR	288.3
LE	1.20 ft

Example: If FR RATIO = 1.00 and FR = 2.00 m³/h, changing the FR RATIO to 1.100 will result in a new FR value of 2.00 x 1.100 = 2.20 m³/h. The LE value will remain unchanged.

6.2.7 FLOW INDEX

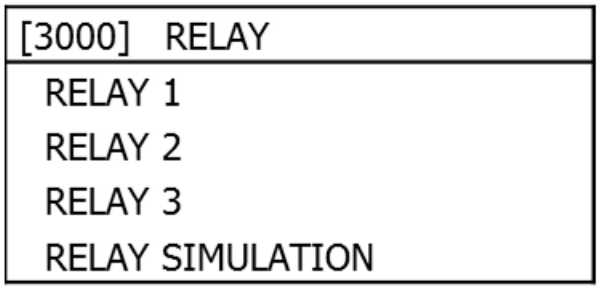
The instantaneous flow rate at the set flume height can be searched from the maximum to the minimum flow rate in both m3/h and GPM units.

[2700] FLOW INDEX	
FLOW INDEX	00.183 ft
m3/h	0.016
GPM	0.069

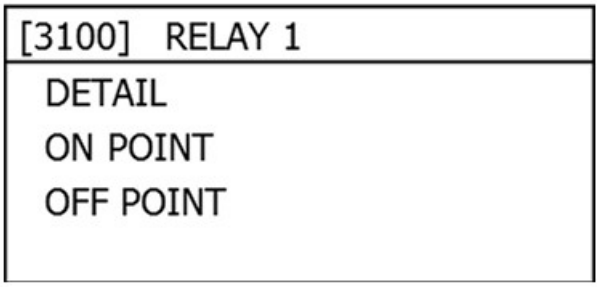
Button usage instructions

	• Set Detailed Values
	• Move to the upper-level or lower-level directory menus. • Move to Different Setting: Change the position or focus when setting detailed values.
	• Complete Input and Save
	• Switch to Setting Mode from Measurement Mode • Return to Measurement Mode

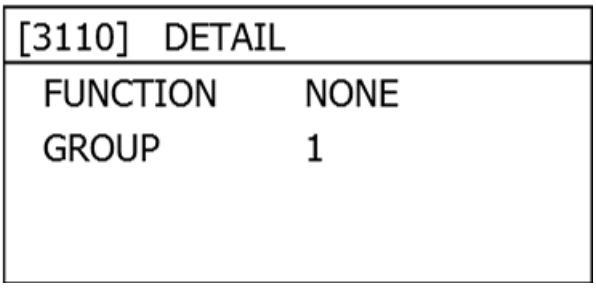
6.3 RELAY



6.3.1 RELAY 1



6.3.2 DETAIL



Function

This is the mode for selecting the relay's operation mode:

- NONE: The relay is not used.
- ALARM An alarm signal can be triggered if the error persists beyond the specified Fail Safe Time value.
- ALTERNATE (Alternating Operation): The relay operates sequentially based on the set ON/OFF POINT values and the measured values of the configured Group

Example: If Group 1 has Relay 1 and Relay 2, Relay 1 will operate until the first ON/OFF point, and then Relay 2 will operate at the subsequent ON/OFF point. This behavior will repeat alternately.

LIMIT: The relay operates according to the set ON/OFF POINT values.

Group
When using ALTERNATE (Alternating Operation), specify the GROUP to be used.

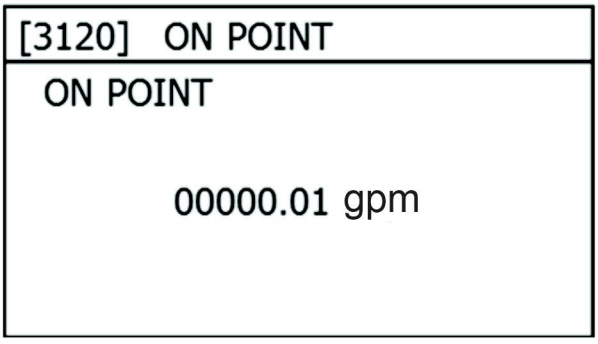
[Selection range: 1 ~ 2]

Sensor	The maximum configurable range	Factory default settings
SR50	0. 20~50.00	16.40ft

(2) 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 is equal to or greater than the ON POINT.

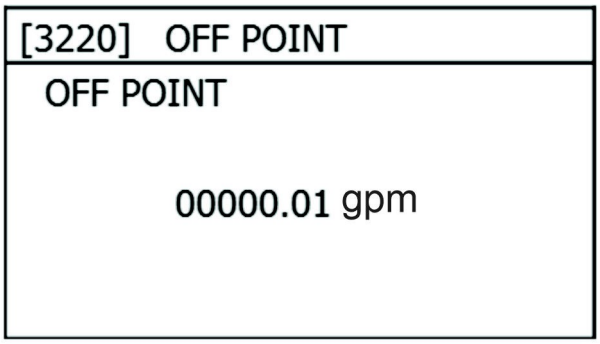
If the OFF POINT is larger than the ON POINT, the relay will turn ON when the measured value is equal to or less than the ON POINT.



(3) OFF 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 is equal to or greater than the ON POINT.

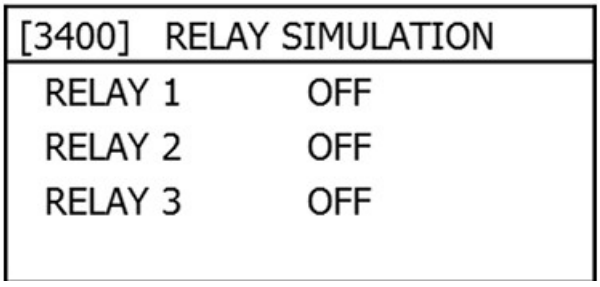
If the OFF POINT is greater than the ON POINT, the relay will turn ON when the measured value is equal to or less than the ON POINT.



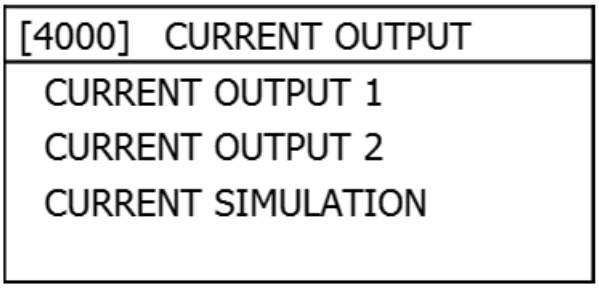
6.3.2 RELAY2
It is the same as RELAY1.

6.3.3 RELAY3
It is the same as RELAY1.

6.3.4 RELAY SIMULATION
You can manually test the relay by turning it ON/OFF.



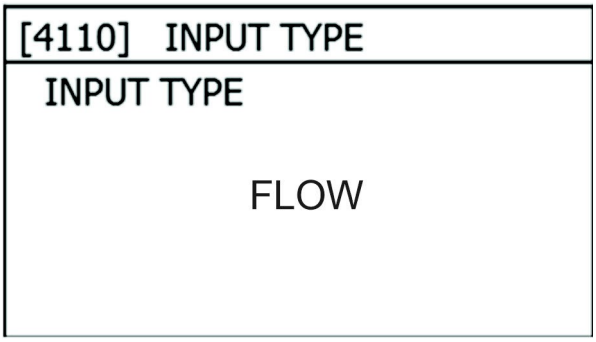
6.4 CURRENT OUTPUT
This menu is used to configure the settings required to convert the measured values into current output.



6.4.1 CURRENT OUTPUT 1, 2

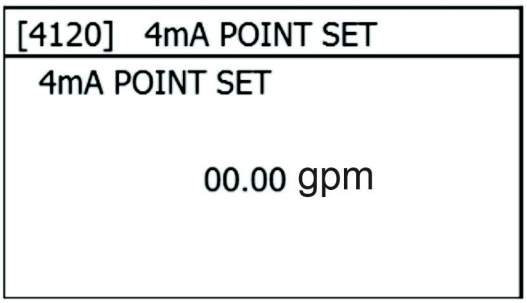
(1) INPUT TYPE

This menu is used to set the output values.
[Selection range: LEVEL / FLOW]



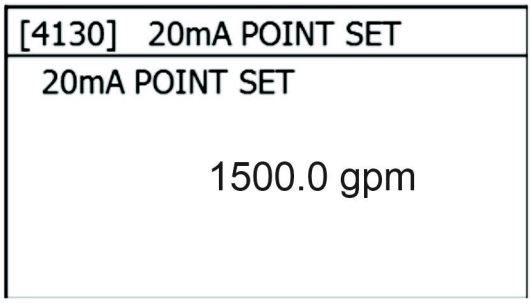
(2) 4mA POINT SET

This menu allows you to input the minimum level at which the current output becomes 4mA.



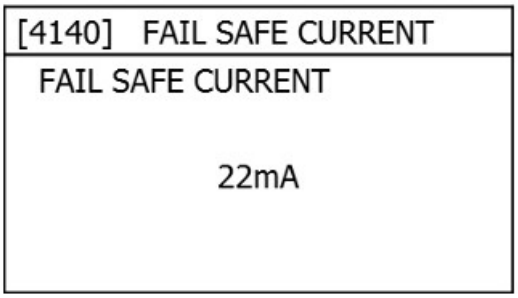
(3) 20mA POINT SET

This is a menu for entering the minimum water level at which the current output becomes 20mA.



(4) FAIL SAFE CURRENT

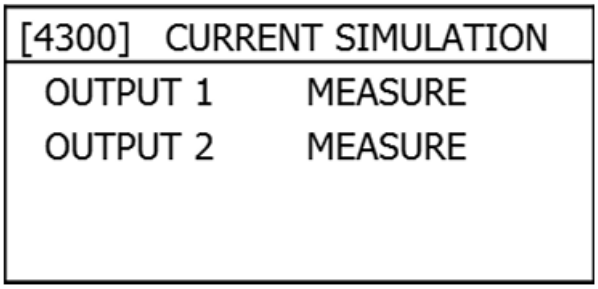
This menu is used to set the current output behavior in case of an error.
[Setting range: 3.8mA, HOLD, 22mA]



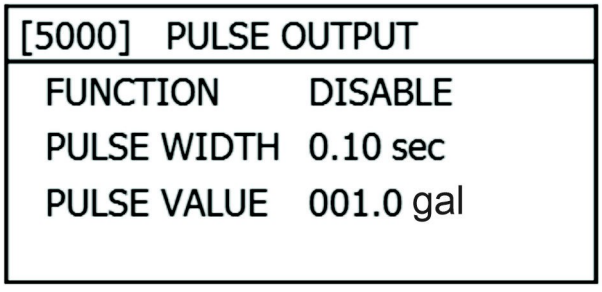
6.4.2 CURRENT SIMULATION

This menu allows you to configure the output for CURRENT OUTPUT (Channel 1 and Channel 2) to the selected values.

[Setting range: MEASURE / 3.8mA / 4mA / 12mA / 20mA / 22mA]



6.5 PULSE OUTPUT



6.5.1 FUNCTION

DISABLE: The PULSE OUTPUT function is not used.
ENABLE: The PULSE OUTPUT function operates according to the set values.

6.5.2 PULSE WIDTH

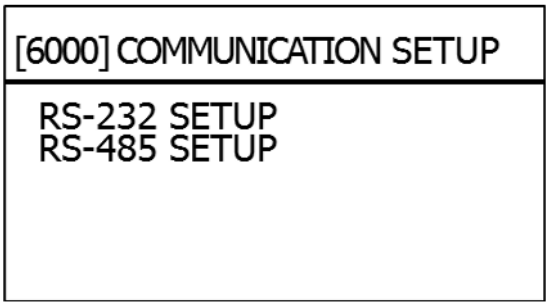
This menu is used to set the pulse width for one pulse output based on the flow rate set in the PULSE VALUE item. [Factory default value: 0.10 sec, Setting range: 0.01 ~ 1.00 sec, Unit: 0.01 sec]

6.5.3 PULSE VALUE

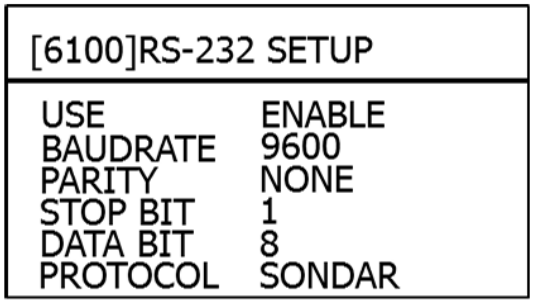
This menu allows you to set the flow rate per pulse. For example, if you input 1.0 GAL, it means that one pulse corresponds to the release of 1.0 Gal of flow.

6.6 COMMUNICATION SETUP

This menu allows you to change the settings for RS-232 and RS-485.



6.6.1 RS-232 SETUP

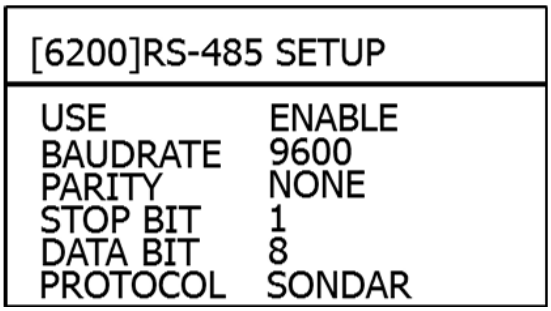


Menu	Description
USE	Select whether to enable or disable RS-232. • ENABLE • DISABLE
BAUDRATE	Choose the RS-232 communication speed. • 4800 bps • 9600 bps • 14400 bps • 19200 bps • 38400 bps • 57600 bps • 115200 bps
PARITY	Choose whether to use a parity bit. • None • Odd • Even
STOP BIT	Select the STOP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

Information

The available options may vary depending on the communication options selected during the product order.

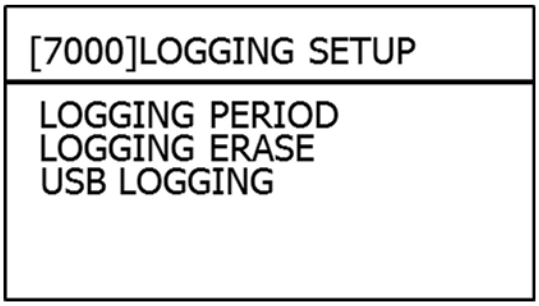
6.6.2 RS-485 SETUP



It is the same as RS-232 SETUP.

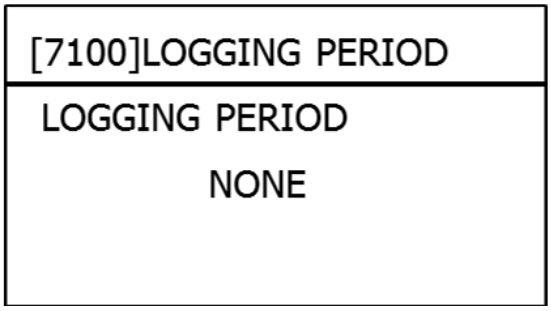
6.7 LOGGING SETUP

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



6.7.1 LOGGING PERIOD

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



The data logging interval and the corresponding maximum storage period are as follows:

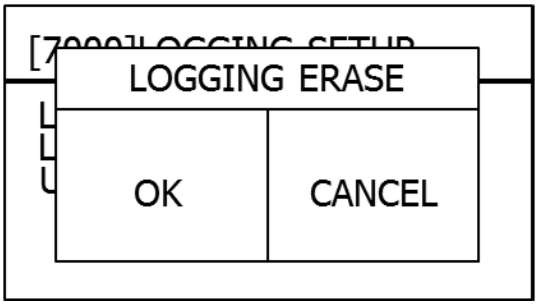
Logging Interval	Max. Strorage Period
10 SEC	2 days
1 MINUTE	11 days
5 MINUTE	56 days
10 MINUTE	112 days
15 MINUTE	168 days
30 MINUTE	336 days
60 MINUTE	672 days

(16,128 points)

6.7.2 LOGGING ERASE

When you select the Delete Logging Records menu, a popup will appear as shown below.

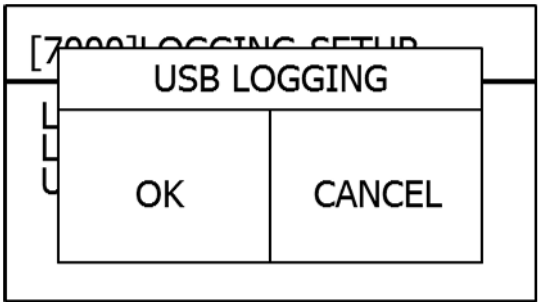
By selecting OK, you can initialize (delete) the stored logging records.



6.7.3 USB LOGGING

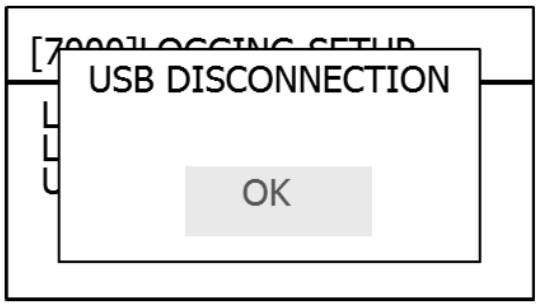
When a USB is connected, a popup will appear as shown below.

By selecting OK, the stored logging data will be transferred as an Excel file to the connected USB.



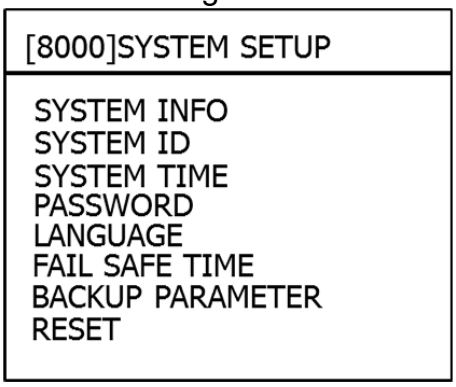
If the USB is not connected, a popup will appear as shown below.

After connecting the USB, press the OK button to dismiss the error popup.

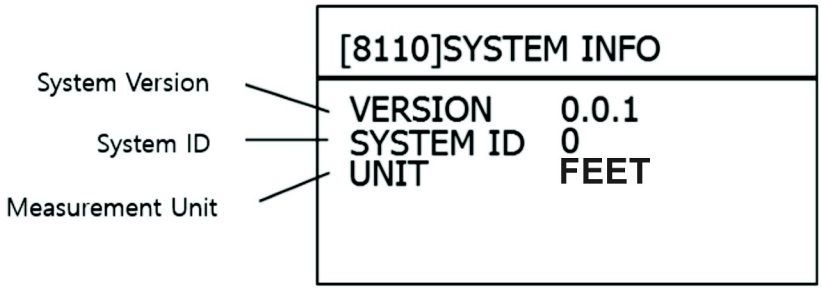


6.8 SYSTEM SETUP

This menu is for configuring system-related settings.



6.8.1 SYSTEM INFO

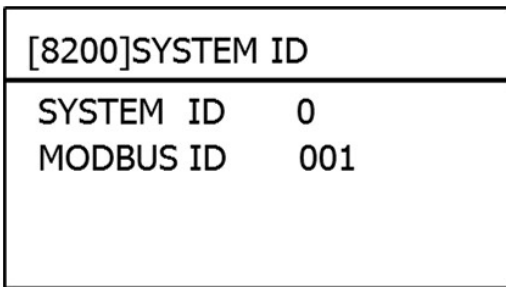


6.8.2 SYSTEM ID

This menu allows you to set the System ID.

Press the [ENTER] button to enter the setting mode, then use the [UP/DOWN] buttons to input the desired value.

- The valid range for System ID is 0 to 99.
- The valid range for Modbus ID is 1 to 247.

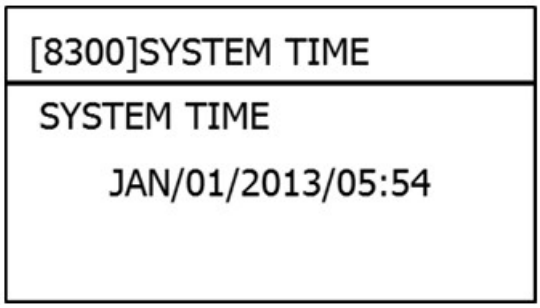


Menu	Description
SYSTEM ID	Sets the SYSTEM ID used for the SONDAR protocol.
Modbus ID	Sets the Slave ID required when using the Modbus protocol.

6.8.3 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.
Use the [UP/DOWN] arrow buttons to adjust the values.

Valid range: January 1, 2000, 00:00 to December 31, 2099, 23:59

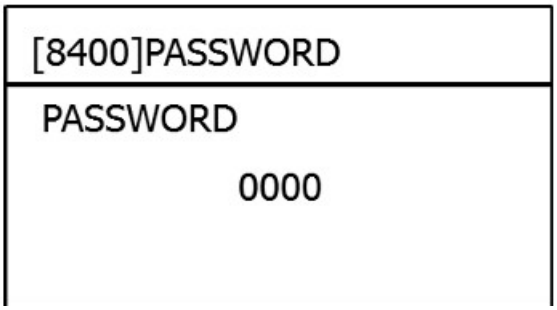


6.8.4 PASSWORD

This menu allows the user to set a password.
By default, no password is set at the time of shipment. Once a password is set, it must be entered whenever making changes to the menu settings.

Use the [UP/DOWN/LEFT/RIGHT] arrow buttons to select the desired 4-digit number, then press the [ENTER] button to save the password.

Setting range: 0000 to 9999

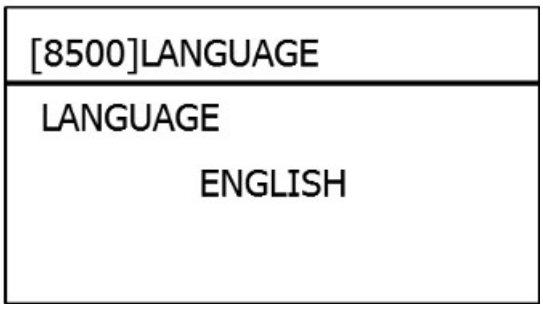


Caution

If the password is lost, switching to Setup Mode will not be possible. Please manage your password carefully to avoid any inconvenience.

6.8.5 LANGUAGE

This menu allows you to set the system language. Currently, only English is supported.



6.8.6 FAIL SAFE TIME

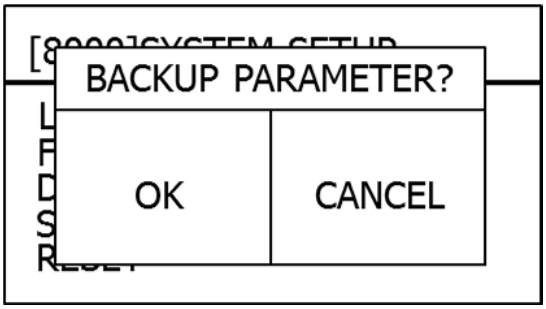
This menu allows you to set the error timeout duration—the time after which an error current output and alarm signal are triggered if the sensor fails to receive data due to device malfunction or external environmental factors.

[Factory Default: 300 sec | Adjustable Range: 20 ~ 999 sec]

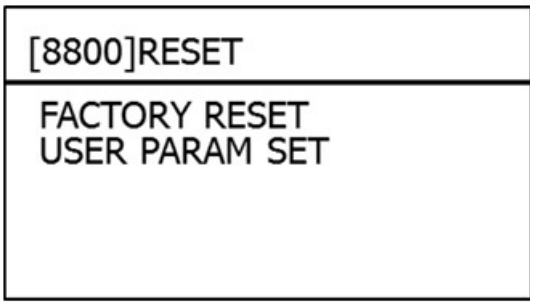


6.8.7 BACKUP PARAMETER

You can save the currently configured menu values using this menu.
When selected, a popup will appear as shown below.
Use the [←/→] arrow buttons to move the cursor, and select OK to save the current settings.
Later, when performing a Reset, you can load these saved values to restore the system to the saved state.



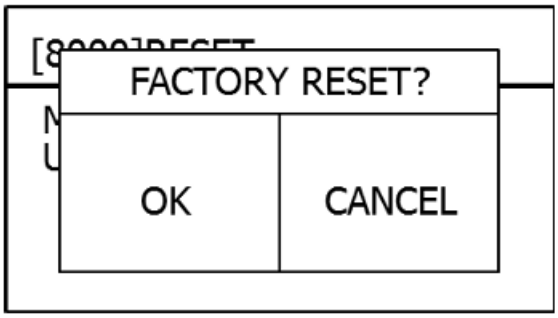
6.8.9 RESET

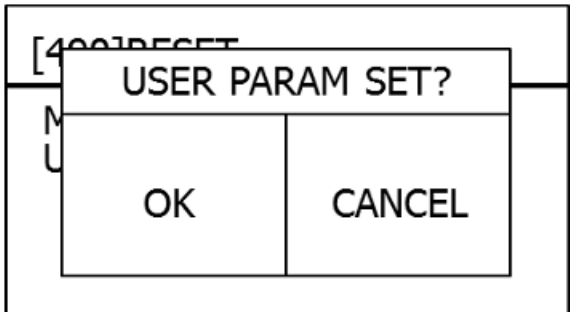


FACTORYRESET
This is the menu to reset the currently operating device.
If you select the MASTER RESET function, all menu settings will be restored to the factory default values.

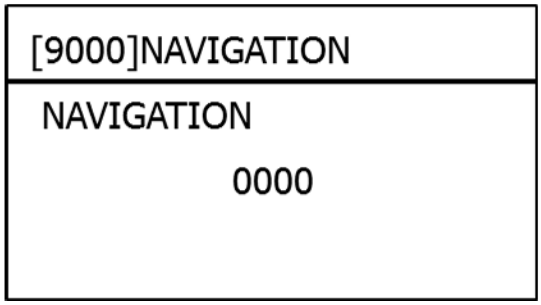
USERPARAMSET
This is the menu to reset the currently operating device.

If you select the USER RESET function, the settings will be initialized to the menu values saved in SETTING BACKUP.

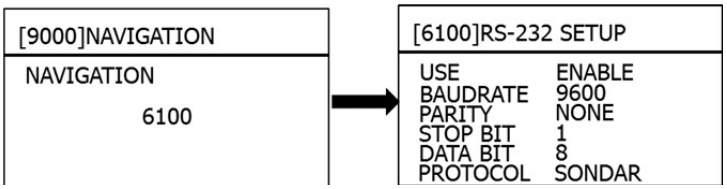




This menu allows the user to quickly access a desired menu by entering its designated number, if known.



Example: If you want to move to the LOGGING PERIOD menu, enter the menu number [6100] to directly access that menu..



7. Operating Menu Overview

1st MENU	2nd MENU	3rd MENU	Configuration Range	Default
LEVEL (1000)	UNIT		mm/ cm/ m/ in/ yd/ ft	m
	EMPTY		0.2 ~ 15.00m	5m
	DEAD ZONE		0.2 ~15.00m	0.2m
	DAMPING		SLOW/NORMAL/FAST/VFAT	NORMAL
	DETECT METHOD		CLOSEST / STRONGEST	CLOSEST
FLOW (2000)	FLOW UNIT (2100)		l/m, ft3/s, gal/min(US), gal/min(UK),MSD(US),MSD(UK), m3/h, m3/d	m3/h
	DEVICE SELECTION (2200)	1. Parshall Flume (2210)	1in/2in/3in/6in/9in/1ft/1.5ft/2ft/3ft/ 4ft/5ft/6ft/8ft/10ft/12ft	1in
		2. Rect. Suppressed (2220)	1ft/1.5ft/2ft/2.5ft/3ft/4ft/5ft/6ft/8ft/ 10ft	1ft
		3. Rect. Contracted (2230)	1ft/1.5ft/2ft/2.5ft/3ft/4ft/5ft/6ft/8ft/ 10ft	1ft
		4. V-Notch Weir (2240)	22.5°/30°/45°/60°/90°/120°	22.5°
		5. Clpoletti Weir (2250)	1ft/1.5ft/2ft/2.5ft/3ft/4ft/5ft/6ft/8ft/ 10ft	1ft
		6. Lepold Lagco Flume (2260)	4in/ 6in/ 8in/ 10in/ 12in/ 15in/ 18in/ 21in/ 24in/ 30in	4in
		7. Palmer Bowlus Flume (2270)	4in/ 6in/ 8in/ 10in/ 12in/ 15in/ 18in/ 21in/ 24in/ 27in	4in
		8. H-Flume (2281)	0.5H/ 0.75H/ 1.0H/ 1.5H/ 2.0H/ 2.5H/ 3.0H/ 4.5H/ 0.4HS/ 0.6HS/ 0.8HS/ 1.0HS/ 3.0HS/ 4.0HS	0.5H
		9.TRAPEZOIDAL Flume (2281)	Sm.60°V / Lg.60°V / XL 60°V / 3.0' 60°V/ 2"45° WSC / 12" 45° SRCRC/ 2.0' SRCRC	Sm.60°V

1st MENU	2nd MENU	3rd MENU	4th MENU	5th MENU	Configuration Range	Default
FLOW (2000)	DEVICE SELECTION (2200)	10.DIY Curve/ Special	DIY CURVE (2291)	MAX HEIGHT	DEAD ZONE ~ EMPTY	5m
				DIY CURVE 1~20	0.1 ~ 200000.0 m3/h	0.1
			Q=K*H(PWR) (2292)	K	K value obtained from known data or calculation constant(0.001~9.999)	0.0001
				PWR	PWR value obtained from known data or calculation constant(0.001~9.999)	0.001
				H	mm / cm / m/ in /yd / ft	m

				Q	m3/h, m3/d, l/min, ft3/s, GPM[UK], GPM[US], MGD(UK), MGD[US]	m3/h
			Rectangular Weir (2293)	Crest Length	0.01 ~ 10.00m	0.1m
				Selection	1.Suppressed / 2.Contracted	1
	LOW CUT VALUE (2300)				0.00 ~ Max. Flow Rate	0
	HIGH CUT VALUE (2400)				0.00 ~ Max. Flow Rate	200000 m3/h
	TOTALIZER (2500)	TOTAL FLOW SET (2510)			0.00~999999999.99 Unit 0.01 m3	0
		TOTAL TIME SET (2520)			0~999999999 Unit 1h	0
	FR RATIO (2600)				0.001 ~ 9.999	1
	FLOW INDEX (2700)				0.001m~EMPTY(Flow Simulation Menu Based on Input Level)	
RELAY(3000)	RELAY1 (3100)	DETAIL (3110)	FUNCTION		NONE/LIMIT/ ALTERNATE/ALARM	NONE
			GROUP		1, 2	1
		ON POINT (3120			0.01 ~ Max. Flow Rate Unit 0.01m3 /h	0.01
RELAY(3000)		OFF POINT (3130)			0.01 ~ Max. Flow Rate Unit 0.01m3 /h	0.01
	RELAY2 (3200)	DETAIL (3210)	FUNCTION		NONE/LIMIT/ ALTERNATE/ALARM	NONE
			GROUP		1, 2	1
		ON POINT (3220			0.01 ~ Max. Flow Rate Unit 0.01m3 /h	0.01
	RELAY3 (3200)	DETAIL (3310)	FUNCTION		NONE/LIMIT/ ALTERNATE/ALARM	NONE
			GROUP		1, 2	1
		ON POINT (3320)			0.01 ~ Max. Flow Rate Unit 0.01 m3/h	0.01
	SIMULATION (3400)	RELAY 1 ~ RELAY 3			ON/OFF	OFF

1st MENU	2nd MENU	3rd MENU	Configuration Range	Default
CURRENT OUTPUT(4000)	CURRENT OUTPUT1 (4100)	INPUT TYPE(4110)	LEVEL / FLOW	FLOW
		4mA POINT SET(4120)	0.00 ~ Max. Flow Rate or (0.00~ EMPTY)	0
		20mA POINT SET(4130)	0.00 ~ Max. Flow Rate or (0.00~ EMPTY)	200,000 m3 /h
		FAIL SAFE CURRENT(4140)	3.8mA/HOLD/22mA	22mA
	CURRENT OUTPUT2 (4200)	INPUT TYPE(4210)	LEVEL / FLOW	LEVEL
		4mA POINT SET(4220)	0.00 ~ Max. Flow Rate or (0.00~ EMPTY)	0

		20mA POINT SET(4230)	0.00 ~ Max. Flow Rate or (0.00~ EMPTY)	5.0m
		FAIL SAFE CURRENT(4240)	3.8mA/HOLD/22mA	22mA
	SIMULATION (4300)	OUTPUT 1	MEASURE/3.8mA/4mA/ 12mA/20mA/21mA	MEASURE
		OUPUT 2	MEASURE/3.8mA/4mA/ 12mA/20mA/21mA	MEASURE
PULSE OUTPUT(5000)	FUNCTION		NONE / USE	NONE
	PULSE WIDTH		0.01~1.00 Unit 0.01sec	0.01sec
	PULSE VALUE		0.1~200 m3/h	1 m3/h
COMMUNICATION SETUP(6000)	RS-232 SETUP (6100)	USE	ENABLE / DISABLE	NONE
		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	SONDAR/KICT/ MODBUS-RTU/ MODBUS-ASCII	SONDAR
	RS-485 SETUP (6200)	USE	ENABLE / DISABLE	NONE
		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	SONDAR/KICT/ MODBUS-RTU/ MODBUS-ASCII	SONDAR
LOGGING SETUP (7000)	LOGGING PERIOD (7100)	LOGGING PERIODE	NONE/10 SEC/ 1 MINUTE/ 5 MINUTE/ 10 MINUTE/ 15 MINUTE/ 30 MINUTE/ 60 MINUTE	NONE
	LOGGING ERASE (7200)			
	USB LOGGING (7300)			
SYSTEM SETUP (8000)	SYSTEM INFO (8100)			
	SYSTEM ID (8200)	SYSTEM ID	0~99	1
		MODBUS ID	1~247	1
	SYSTEM TIME (8300)	SYSTEM TIME	2000/00/00/ 00:00 ~ 2099/12/31 23:59	2013/1/1/0 0:00
	PASSWORD (8400)	PASSWORD	0~9999	0
	LANGUAGE (8500)		ENGLISH	ENGLISH
	FAIL SAFE TIME (8600)		20~999sec	300sec
	BACKUP PARAMETER (8700)			
	RESET (8800)	FATORY RESET(8810)		
		USER PARAM SET(8820)		

NAVIGATION (9000)				

8. Maintenance

1. Built-in Battery

- The RFM8000 is equipped with a built-in CR-2032 battery.
- The average lifespan is approximately 10 years, but it may be shortened depending on the operating temperature.
- Please make sure to replace the battery in advance before it is fully depleted.



Due to battery depletion, TIME DATA will not be backed up in the event of a power outage. In such cases, the manufacturer assumes no responsibility.

2. Sensor

- Please inspect the cable between the sensor and controller regularly to ensure there are no short circuits.
- Check the underside of the sensor regularly for any accumulated debris or contamination, and clean it if necessary.

3. Controller

- Regularly check that the current output remains within the normal 4-20mA range.
- Regularly verify that the display matches the actual level measurement.
- Ensure that the rated power supply is being properly applied.
- Check the Echo Trend screen periodically to confirm that no noise is present.

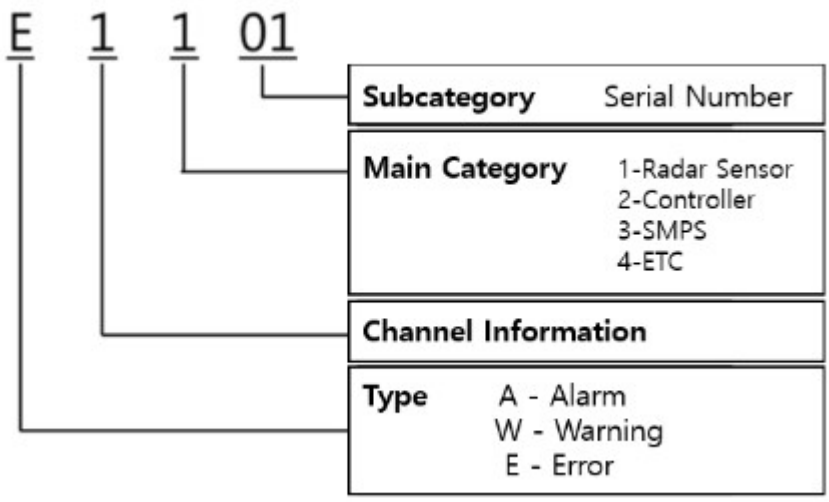
9. Troubleshooting

9.1 Error Code

The RFM8000 stores 10 types of error codes.

Based on these error codes, users can perform self-diagnosis and troubleshooting, helping to reduce the time and cost associated with product failures.

Each error code consists of a 5-character combination of letters and numbers, and the meaning of each character is explained below.



9.2 Self-Diagnosis

When an error code is displayed on the screen, please refer to the table below to identify and resolve the issue.

If the problem persists despite following the suggested solutions, please contact our customer service center for further assistance.

Information

A QR code label containing explanations of error codes is attached inside the controller.
If you do not have the manual on hand at the worksite, you can scan the QR code to access the relevant information.

ERROR CODE	Cause of the Problem
E1101	Sensor 1 Not Detected
E2101	Sensor 2 Not Detected
E0101	Sensor 1 & 2 Not Detected
E0201	Flash Memory Malfunction in Controller
E0202	EEPROM Memory Malfunction in Controller
E0203	Real Time Clock (RTC) Malfunction in Controller
E1204	Abnormal Receiving Signal from Sensor 1
E2204	Abnormal Receiving Signal from Sensor 2
E0204	Abnormal Receiving Signal from Sensor 1 & 2

E1101

This error occurs when Sensor 1 is not connected or fails to be recognized even though it is connected. Please follow the steps below to troubleshoot the issue

If the sensor is not functioning:

1. Check if the sensor cable is cut or short-circuited by visual inspection or using a tester. If any issue is found, repair or replace the cable. If the issue persists, refer to step (3).
2. Ensure the sensor cable is securely connected to the correct terminal on the controller. Gently pull on the cable to check the connection. If loose or incorrect, reconnect properly.
3. If the problem is not resolved after steps (1) and (2), please contact the service center or your distributor.
4. If you have a spare sensor, replace the current sensor and test again. If the spare sensor works normally, the original sensor is likely faulty. If the spare also fails, check the controller for potential issues.
5. If the sensor is determined to be faulty, it must be repaired or replaced. Please contact the service center or your distributor.

E2101

This error occurs when Sensor 2 is not connected or fails to be recognized even though it is connected.

To resolve this issue, please follow the same troubleshooting steps as described for error code E1101.

E0101

This error occurs when both Sensor 1 and Sensor 2 are not connected, or are connected but not recognized by the controller.

To resolve this issue, please follow the same troubleshooting steps as described for error code E1101.

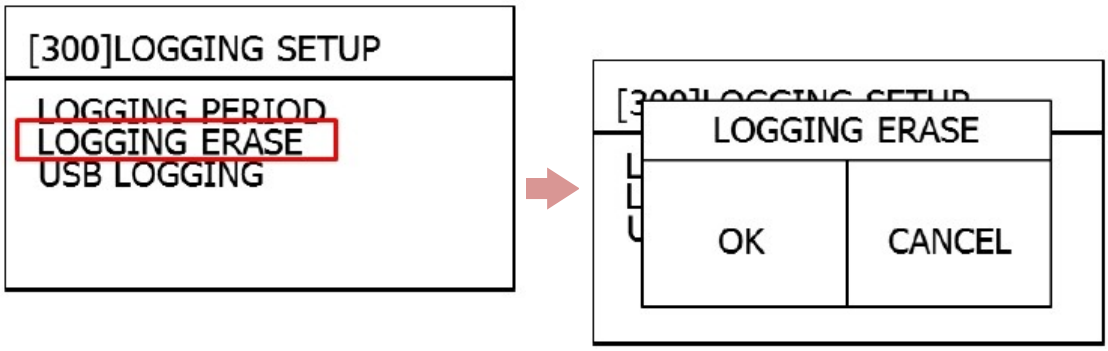
E0201

This error occurs when the flash memory installed inside the controller is not functioning properly. To resolve this issue, please follow the steps below:

Recovering Logging Data
If the flash memory is malfunctioning, it is generally difficult to recover previously stored data. If data recovery is required, the device must be sent to our service center for inspection and service.

Deleting Logging Data
Attempt to reset the flash memory through the system menu.

Navigate to Menu [300] LOGGING SETUP, then select LOGGING ERASE. This will delete existing logging data and reset the flash memory.



If the same issue persists after performing the reset, please contact our service center or your place of purchase for further assistance.

E0202

This error occurs when the EEPROM memory installed in the controller does not operate properly.

To resolve the issue, please proceed as follows:

• Contact our service center.

• The EEPROM memory stores critical information about the device and should not be handled by unqualified personnel. For detailed inspection and repair, please contact our service center or your place of purchase.

E0203

This error occurs when the Real Time Clock (RTC) installed in the controller is not functioning properly.
To resolve the issue, please proceed as follows:

• Contact our service center.

• The Real Time Clock is a sensitive component that should not be handled by unqualified personnel. For detailed inspection and repair, please contact our service center or your distributor.

E1204

This error occurs when the signal received from Sensor 1 is not functioning properly, and "LE" blinks on the display. To resolve the issue, please follow the steps below:

Check sensor installation position	Make sure the sensor is installed perpendicular to the surface of the measured material. If properly installed, "DT" will be displayed.
Check for contamination on the sensor surface	Inspect the sensor's radiating surface for any foreign substances. If the surface is contaminated, gently wipe it with a soft cloth.
Check the bottom distance setting	Make sure the EMPTY value is set within the proper range.
	If the problem persists, please contact our service center or your distributor.

E2204

This error occurs when the signal received from Sensor 2 is not being properly detected and "LE" blinks on the screen.

The troubleshooting steps are the same as for error code E1204.

E0204

This error occurs when the signals from both Sensor 1 and Sensor 2 are not being properly received and "LE" blinks on the screen.

The troubleshooting steps are the same as for error code E1204.

APPENDIX A - RS-232/RS-485 Protocol

1. Protocol

1.1 Output Data Format

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

Data Field	Start of DATA						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		Level							Flow Rate													
Byte Number	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45							
Data	0	0		M		0	0	0	0	0	0		0	0	0	0	0	0								
Data Field	Total Flow									Temperature Unit			Temperature					End of DATA								
Byte Number	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65						
Data	0	0	0	0	0	0		0	0		C		+/-	0	0	0		0	$n	$r						

The blank spaces in the table represent a space character (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	Displays the unit of the data.
Level	Displays the measured level.
Flow Rate	Displays the instantaneous flow rate.
Total Flow	Displays the total flow value
Temperature Unit	Displays temperature units in Celsius (℃) or Fahrenheit (℉).
Temperature	RESERVE
End of Data Character	nr(Line feed(0x12), carriage return(0x15))

	Level	Flow Rate	Total Flow
M	meter	㎥/h	㎥
c	centimeter	㎥/h	㎥
m	millimeter	㎥/h	㎥
f	feet	GPM[US]	ft^3
i	inch	GPM[US]	gal[US]
y	yard	GPM[US]	gal[US]

2. Modbus

The RFM8000 supports both Modbus RTU and Modbus ASCII modes.

All registers are read-only (Read Holding Registers only), and 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(RFM8000) 10 = Flow(RFM8000) 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
	Measurement Unit(Flow)	8003	32771	8002	32770	1	1 = cubic meters per hour [m3/h] 2 = cubic meters per day [m3/d] 3 = liters per second[l/s] 4 = cubic feet per second [ft3/h] 5 = imperial gallons per minute [gal/m] 6 = US gallons per minute [gal/min] 7 = imperial million gallons per day[MGD] 8 = US million gallons per day [MGD]		R
	Temperature Unit	8004	32772	8003	32771	1	0 = ℃ (Reserved) 1 = ℉ (Reserved)		R
Data	Distance	8011	32785	8010	32784	2	Distance	float	R
	Level	8013	32787	8012	32786	2	level	float	R
	Flow rate	8021	32801	8020	32800	2	Flow rate	float	R
	Max. flow rate of the day	8023	32803	8022	32802	2	Max. flow rate	float	R
	Min. flow rate of the day	8025	32805	8024	32804	2	Min. flow rate	float	R
	Total flow	8027	32807	8026	32806	2	Sensor2 level	float	R
Data	Total hour	8029	32809	8028	32808	2	Sensor2 space	float	R

	Temp 1(inside)	802B	32811	802A	32810	2	Reserve	float	R
	Temp 2(outside)	802F	32815	802E	32814	2	External temp. sensor	float	R

<Modbus Register Table>

Note: Reserved fields are output as NULL.

2.1 Request PDU Example

Product code Request

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

Distance, Level, Flow Rate, Total Flow 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

2.2 Modbus Register Data type

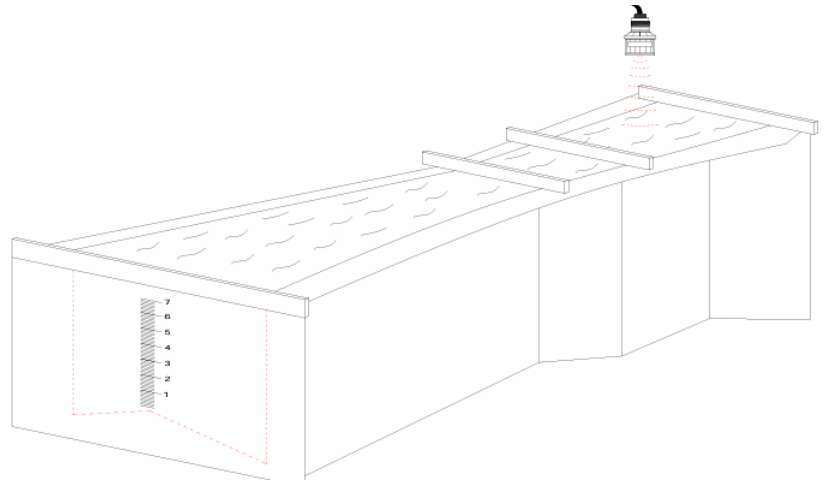
Data field: 4byte float type

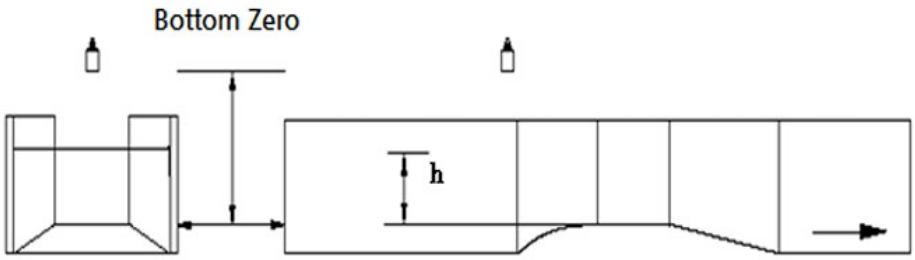
ID, UNIT, Relay field: Unsigned short (2byte) type

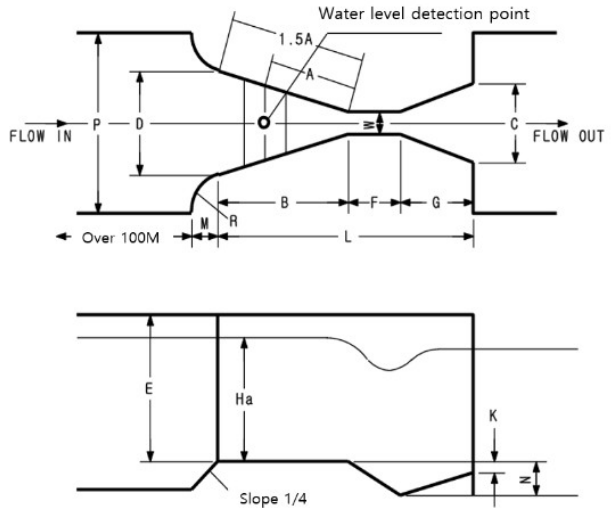
APPENDIX B - Water Channel Diagrams and Overview

1. Parshall Flume

The Parshall flume is standardized and comes in 15 different sizes based on the width of the center of the channel.



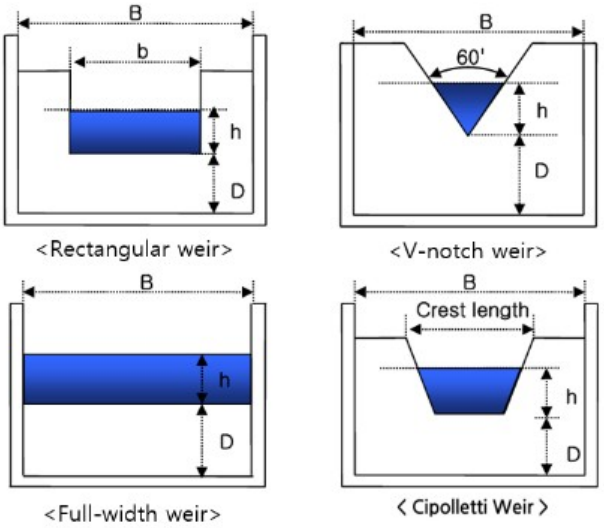


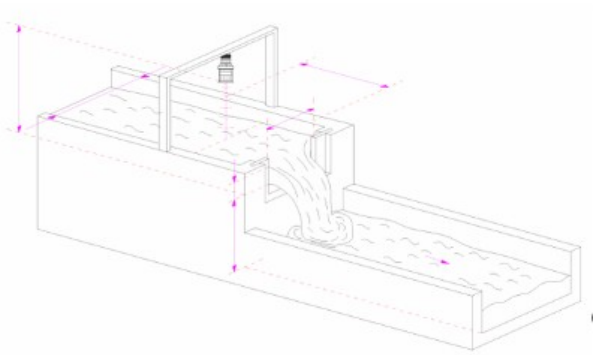


Parshall Flume Diagram

THROAT WIDTH		1 in	2 in	3 in	6 in	9 in	1 ft	8 ft
w		25.4	50.8	75.2	152.4	228.6	304.8	2433.4
Flow Rate	Min m3/h	0.1	0.1	1	1	1	10	357
	Max m3/h	33	100	194	398	907	1641	14220
A		140	245	311	414	587	914	1626
B		230	360	457	610	864	1343	2391
C		75	118	178	394	381	610	2743
D		145	196	259	397	575	845	3397
E		316	440	610	610	762	914	914
F		95	120	152	305	305	160	160
G		135	200	305	610	457	914	914
K		25	25	25	76	76	76	76
N		57	57	57	114	114	229	229
R		240	240	406	406	406	508	610
M		100	180	305	305	305	381	457
P		330	500	768	900	1080	1492	4172
L		525	680	914	1525	1626	2867	3915

2. V-notch weir, Rectangular weir, Full-width weir, Cipolletti Weir





Overview of Rectangular weir