



LM7000 Ultrasonic Level Meter



March 2014

TABLE OF CONTENTS

1. SYSTEM OVERVIEW	6
1. Receiving and Inspection of Product and Packaging	6
2. Safety and Operation	6
3. Warranty.....	6
2. SPECIFICATION	7
LM7000 Controller	7
LM7000 S330 and S500 Sensor	7
External Temperature Sensor.....	7
3. INSTALLATION.....	8
1. General.....	8
2. Controller Installation	8
3. Sensor Installation	8
4. WIRING & POWER.....	10
CPU Board.....	10
Transducer.....	11
Power.....	11
Relay.....	12
Temperature Sensor (Optional).....	12
Analog Output.....	12
Digital Communication	13
Sensor Cable.....	13
5. INITIAL START-UP & DISPLAY.....	14
6. PROGRAMMING	17
PROGRAMMING BUTTONS	17
OPERATING MODE	18
6.1 QUICK SETUP	18
SENSOR.....	18
CURRENT SIMULATION	19
Range: 3.8mA, 4mA, 12mA, 20mA, 22mA,	19
6.2 LEVEL METER SETUP	19
LEVEL	19
SENSOR	20
USE.....	20
This menu is for selecting the sensor use state.	20
SENSOR TYPE	20

	This is the menu for selecting the type of sensor	
	connected.....	20
	EMPTY.....	20
	DEAD ZONE.....	21
	TX POWER.....	21
	RX GAIN.....	21
	TYPE.....	21
	N. THRESHOLD - Not Applicable.....	22
	F. THRESHOLD.....	22
	TEMP TYPE.....	22
	TEMP FIX.....	22
	TEMP.....	22
	DAMPENING.....	23
	SOUND SPEED.....	23
	SOUND SPEED FACTOR.....	23
	LEVEL OFFSET.....	23
	UNIT.....	23
VOLUME.....		24
	TYPE (TANK).....	24
h: Measured level.....		26
	VARIABLE.....	27
	LEVEL TABLE.....	27
	VOLUME TABLE.....	27
	VOLUME SIMULATION.....	27
RELAY.....		28
	RELAY 1 - 3.....	28
	RELAY SIMULATION.....	28
CURRENT OUTPUT.....		29
	CURRENT OUTPUT 1 and OUTPUT 2.....	29
	CURRENT SIMULATION.....	29
COMMUNICATION SETUP.....		29
	RS-232 Setup.....	29
	RS-485 Setup.....	29
	USE.....	30
	BAUDRATE.....	30
	PARITY.....	30
	STOP BIT.....	30
	DATA BIT.....	30
	PROTOCOL.....	30
6.3 LOGGING SETUP.....		31
	Logging Period.....	31
	Logging Erase.....	31
	USB Logging.....	32
6.4 SYSTEM SETUP.....		32
	System Info.....	33
	System ID.....	33
	Modbus ID.....	33

	System Time	33
	Password	33
	Language	34
	Fail Safe Time	34
	Display Type	34
	Backup Parameter.....	34
	Reset	34
	6.5 NAVIGATION	35
7.	MAINTENANCE.....	36
8.	TROUBLESHOOTING - ERROR CODE LIST	36
9.	RS-232/RS-485 PROTOCOL.....	37
	9.1 Flomotion Protocol	37
	9.2 Modbus	38
	Modbus DATA Register Table.....	39
	Request PDU Example.....	40
	Modbus Register Data Type	40
10.	ACCUVIEW SUPPORT SOFTWARE	40
	10.1 Minimum Requirements	40
	10.2 Program Installation	41
	10.3 Initial Display.....	41
	10.4 File Menu	42
	10.5 View.....	43
	10.6 About.....	44
	10.7 Trouble Shooting	45

1. SYSTEM OVERVIEW

1. Receiving and Inspection of Product and Packaging

When opening the LM7000 packaging, inspect all cartons for damage that may have occurred during shipping. Carefully unpack equipment and inspect thoroughly for damage or shortage. Report any damage to carrier and/or shortages to supplier. DO NOT discard any boxes or packaging if damage has occurred.

2. Safety and Operation

In the interest of safety, the installation and operation of the LM7000 shall be performed by licensed or qualified professionals. Before powering the LM7000, please read his manual thoroughly. Flomotion Systems is not responsible for accidents caused by misuse or modification of the product.

3. Warranty

Flomotion Systems, Inc. warrants the LM7000 Series to be free of defects in material and workmanship for a period of one year from date of sale. Under normal use, if the LM7000 becomes defective within the stated warranty time period, contact Flomotion Systems, Inc. for return authorization prior to returning any product. Flomotion Systems, Inc. reserves the right to make the final determination as to the validity of a warranty claim, and sole obligation is to repair or replace only components, which have been rendered defective due to faulty material or workmanship. No warranty claim will be accepted for components which have been damaged due to mishandling, improper installation, unauthorized repair and/or alteration of the product, operation in excess of design specifications or other misuse, or improper maintenance. Flomotion Systems, Inc. makes no warranty that its products are compatible with any other equipment, or to any specific application, to which it may be applied and shall not be held liable for any other consequential damage or injury arising from the use of its products. This warranty is in lieu of all other warranties, expressed or implied. No other person, firm or corporation is authorized to assume, for Flomotion Systems, Inc., any other liability in connection with the demonstration or sale of its products.

2. SPECIFICATION

LM7000 Controller

Measurement Method	Ultrasonic non-contacting
Accuracy	0.2% of F.S.
Resolution	0.04 in (1mm)
Dampening Rate	NORMAL
Data Logging Period	672 days (max. @1hr interval)
Output	Analog: 2 x 4-20ma, max 750 ohm Relay: 3, Form C, 8A at 250VAC Temperature Sensor Temperature Digital: RS-232, RS-485, Modbus
Display	Backlit LCD Graphics Display
NEMA Rating	NEMA 4X
Temperature	-4°F to 140°F (-20°C to 60°C)
Material	Polycarbonate
Dimensions	6.5w x 9.8h x 3.7d in. (166w x 250h x 95d mm)
Weight	4.4lb (2kg)
Power Supply	100-230VAC 50/60HZ, 35VA (17w) Fuse 250V T1.0A 9-30VDC, max 8W

LM7000 S330 and S500 Sensor

Range	S330 - 33ft S500 - 50ft
Beam Angle	10° at -3dB
Process Connection	1" NPT
Weight	3.3 - 4.4 lbs.
Material	PVDF
Temperature	-22°F to 158°F (-30°C to 70°C) 80% relative humidity. Temperature compensated by built in sensor
NEMA Rating	NEMA 6P
Cable	2 Core Shield (AWG18) up to 1,476ft

External Temperature Sensor

Type	NTC 10KΩ
Temperature	-22°F to 158°F (-30°C to 70°C)
Process Connection	1/8" PT
NEMA Rating	NEMA 6P
Cable	RG174

Specifications subject to change without prior notice

3. INSTALLATION

1. General

LM7000 shall be used in accordance with manufacture's specifications.

2. Controller Installation

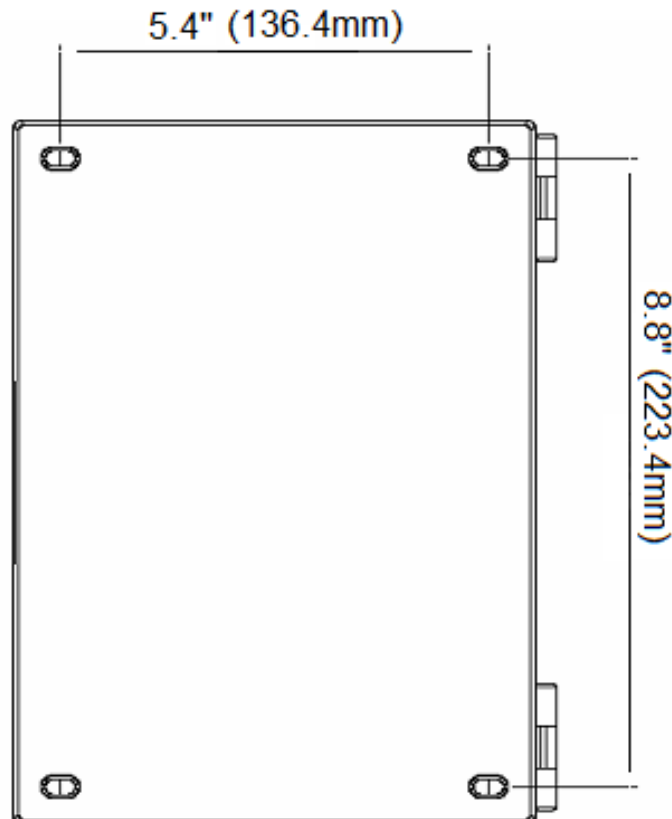
Open controller door and check the four screw holes.

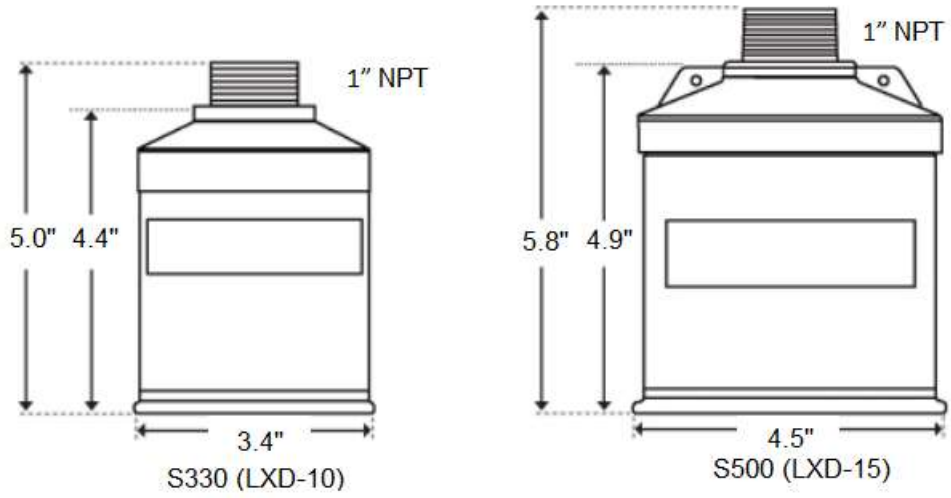
- Level controller.
- Mark and drill the four holes for wall mounting.
- Secure fasteners for the wall mount installation.

3. Sensor Installation

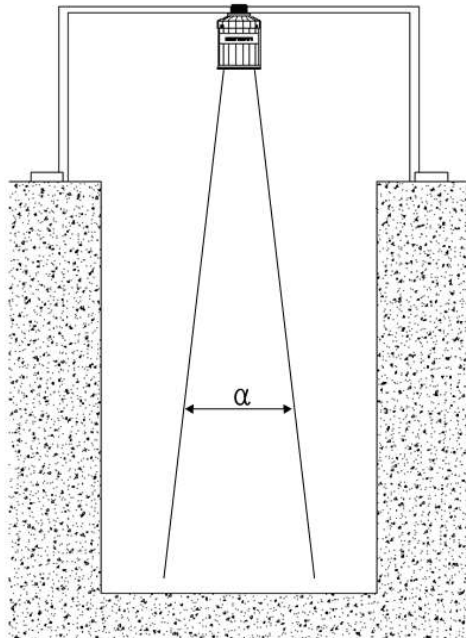
The **S330** (LXD-10) and **S500** (LXD-15) sensor is constructed of PVDF. Please verify chemical compatibility with process before installation.

- The sensor has a 1" NPT (M) for mounting.
- Remove any obstacles between the sensor and measurement point.
- The bottom of the sensor should be perpendicular to the measurement point.
- Avoid mounting the sensor too close to a wall.
- Avoid setting a maximum level into the Dead Zone range.
- Avoid the exposure to direct sunlight.
- Avoid high voltage or high current lines.
- Install on solid, non-vibrating surface.



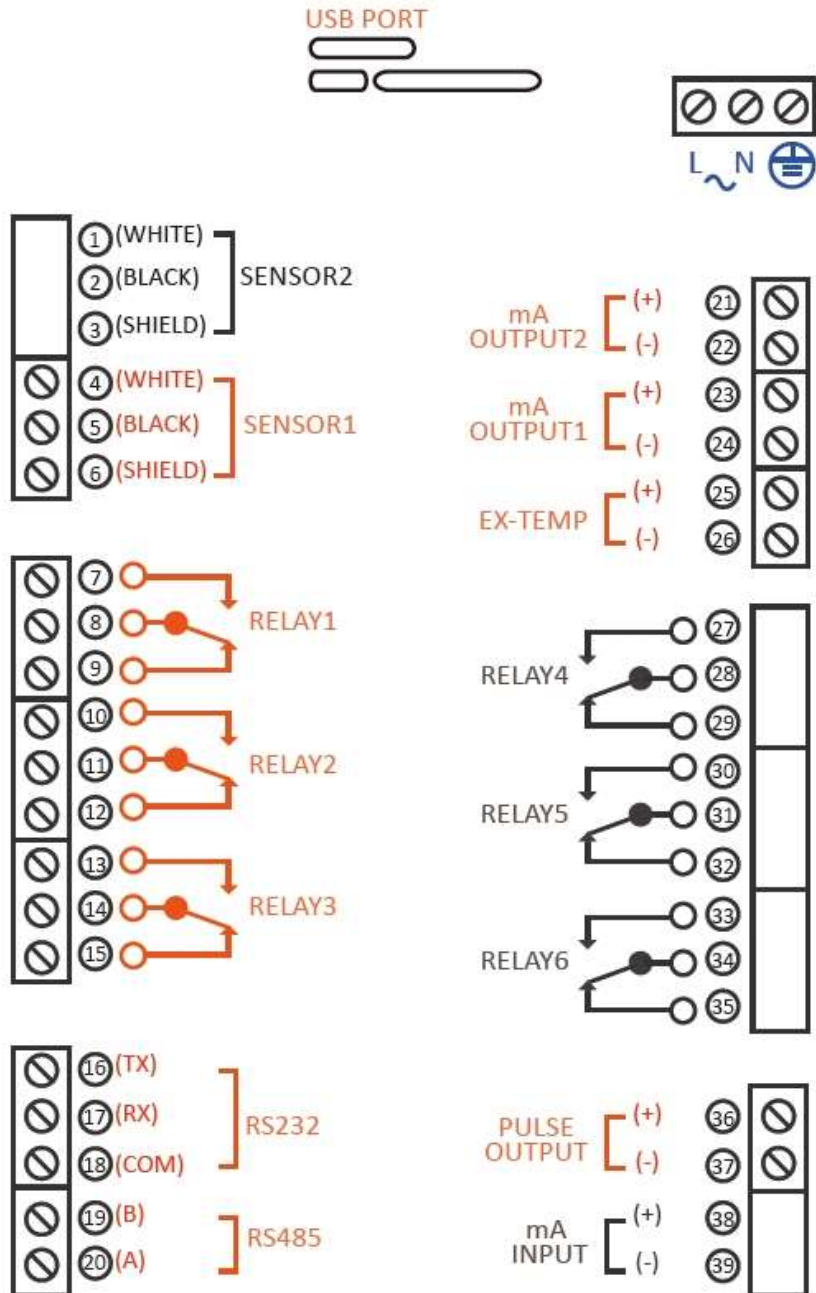


MEASUREMENT DISTANCE	BEAM WIDTH (A)
3ft	3.5"
10ft	10.5"
16ft	18.5"
33ft	37"
50ft	55.5"



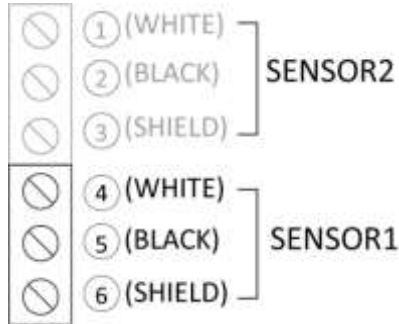
4. WIRING & POWER

CPU Board



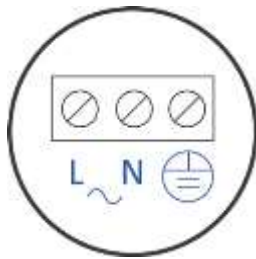
Transducer

Use SENSOR 1 terminal block for S330 and S500 wiring. SENSOR 2 terminal block is NOT available, unless ordered as an option with controller.

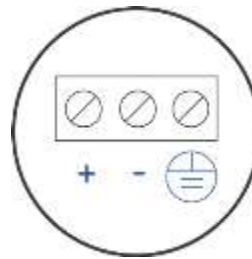


Power

Provide the appropriate voltage to the correct terminal. Provide 100-230VAC, 50/60Hz to AC power terminal as standard. OPTIONAL 9-30VDC power input is available upon request. If the LM7000 is ordered with the optional DC power input, provide 9-30VDC power to the DC power terminal.



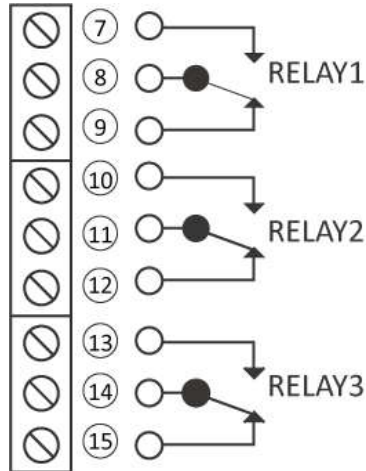
AC Power Terminal



DC Power Terminal

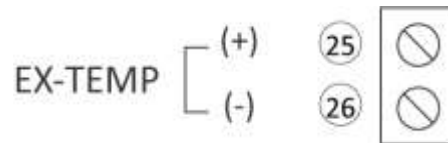
Relay

Three form C, 8A, @ 250VAC relays are provided. The relays can be wired normally open or normally closed.



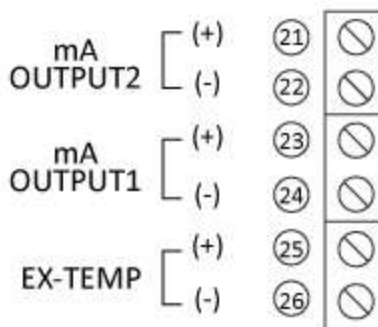
Temperature Sensor (Optional)

Temperature input is a critical factor for accurate measurement. The S330 and S500 sensor has a built-in temperature sensor. If the ambient temperature changes rapidly, an external temperature sensor is recommendable.



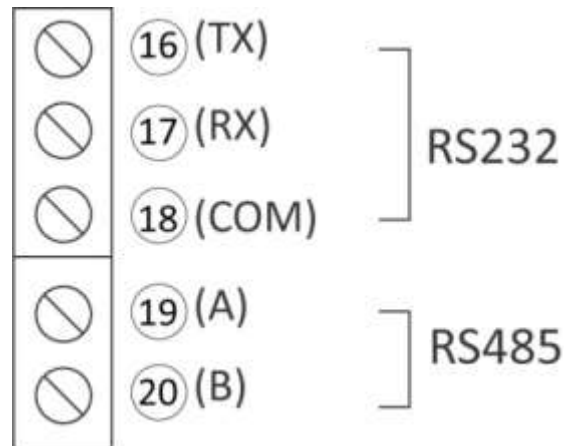
Analog Output

Two 4-20mA outputs are provided for level measurement.



Digital Communication

RS-232 communication is standard. RS-485 and Modbus are options.



Sensor Cable

Grounded metallic conduit is recommended for the transducer cable installation to help eliminate any outside interference.

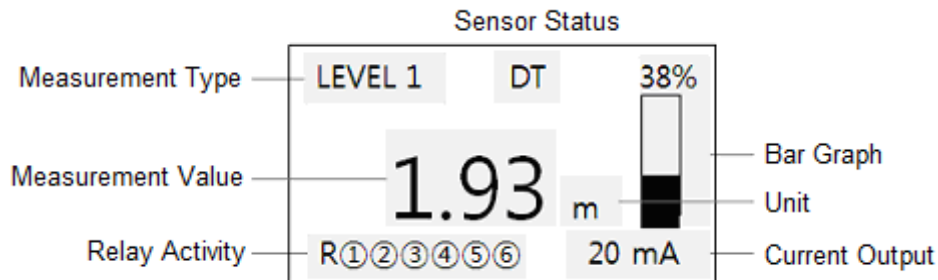
5. INITIAL START-UP & DISPLAY

When power is applied, the current software version is displayed.

Measuring Mode

There are 4 different measuring mode displays. To change between displays modes, press the up and down buttons. When only SENSOR 1 is wired, Display B and Display C aren't shown.

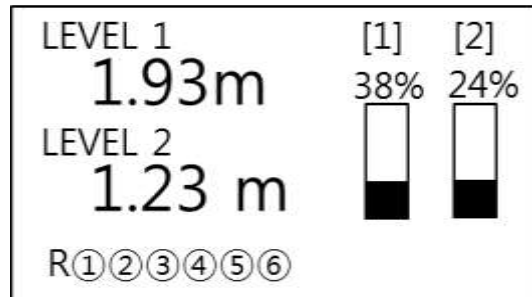
Display A - General



- 1) Measurement Type – shows the measurement type currently being measured and the sensor number currently wired.
 - LEVEL 1: Level measured by SENSOR 1
 - LEVEL 2: Level measured by SENSOR 2
 - DISTANCE 1: Distance measured by SENSOR 1
 - DISTANCE 2: Distance measured by SENSOR 2
 - SPACE 1: Space measured by SENSOR 1
 - SPACE 2: Space measured by SENSOR 2
 - VOLUME 1: Volume measured by SENSOR 1
 - VOLUME 2: Volume measured by SENSOR 2
- 2) Measurement Value – Shows the current measurement value
- 3) Relay Activity – Shows the relay currently wired
- 4) Sensor Status – Shows a sensor condition
 - DT: when it operates normally
 - D: when it receives the reflected signal
 - S1: when the measurement value is over the DAMPENING SPEED (the value is held)
 - S2: when it research the signal
 - LE: when it lost the signal
- 5) Bar Graph - Shows the percentage of LEVEL/DISTANCE/SPACE/VOLUME currently being measured.
- 6) Unit - shows the unit of measurement value
- 7) Current Output - shows the current output value or ambient temperature

Display B – Advanced

All the factors displayed are the same as those shown in Display A. Display B shows two sensor measurements at the same time. When only SENSOR 1 is wired, Display B is not shown.

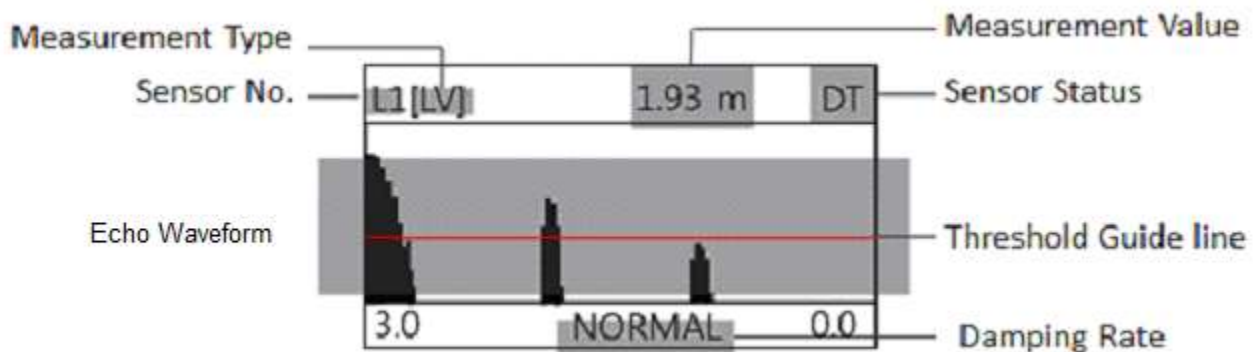


Display C

All the factors displayed are the same as those shown in Display B. Display C shows the difference between LEVEL 1 and LEVEL 2.



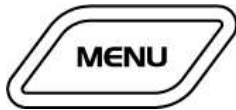
Echo Trend Display



- 1) Measurement Type - shows the measurement type currently being measured
 - [LV]: LEVEL
 - [DIST]: DISTANCE
 - [VOL]: VOLUME
 - [SPACE]: SPACE
- 2) Sensor No. - Shows the sensor number currently activated
 - L1: SENSOR 1
 - L2: SENSOR 2
- 3) Echo Waveform - shows the echo waveform received by the sensor
- 4) Measurement Value - shows the measurement value currently measured
- 5) Sensor Status - shows the sensor condition
 - DT: Normal Operation
 - D: Receipt of deflective signal
 - S1: Measurement value is over DAMPENING SPEED (the value is held)
 - S2: Analyzing Signal
 - LE: Lost Echo/Signal
- 6) Threshold Guide Line - shows the threshold guide line
- 7) Dampening Rate - shows the dampening rate.
 - SLOW
 - NORMAL
 - FAST
 - VERY FAST

6. PROGRAMMING

PROGRAMMING BUTTONS



- Enters Programming Mode and Measuring Mode.



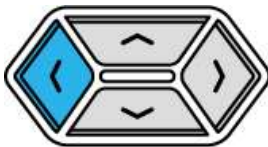
- Select a parameter in Programming Mode.
- Accepts parameter setting.



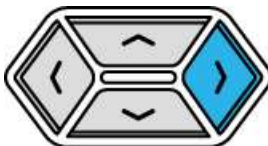
- Changes parameters or parameter setting.



- Changes parameters or parameter setting.



- Return to the previous parameter.
- Moves the cursor to the left when entering numbers.



- Advance to the next parameter.
- Moves the cursor to the right when entering numbers.

OPERATING MODE

Operating Mode can be switched by [MENU] button.

1. QUICK SETUP
2. LEVEL METER SETUP
3. LOGGING SETUP
4. SYSTEM SETUP
5. NAVIGATION

6.1 QUICK SETUP

[100] QUICK SETUP

SENSOR
CURRENT SIMULATION

SENSOR

[110] SENSOR

UNIT	ft
EMPTY	00.00ft
DEAD ZONE	01.00ft
4mA OUT	+00.00ft
20mA OUT	+00.00ft

UNIT

[Default: ft]

Value being measured.

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

EMPTY

Range: S330 - 33ft, S500 - 50ft

Sets the distance between the bottom of the sensor and the “0” level point.

DEAD ZONE

[Default: 00.98ft]

Range: 00.98 - 33ft (S330), 00.98 - 50ft (S500)

Sets the distance from the face of the transducer to the closest readable level.

4mA OUT

This is a mode for setting a distance that the current output is 4mA. This setting is normally set at the point that the water level is zero.

20mA OUT

This is a mode for setting a distance that the current output is 20mA. This setting is normally set at the point that the water level is Maximum (100%).

CURRENT SIMULATION

Range: 3.8mA, 4mA, 12mA, 20mA, 22mA,

This function can simulate the cable connection status and the current output between the central control room and this device. When you move to the CURRENT SIMULATION menu, the measuring process is stopped and the current output becomes initialized to 0.

[130] CURRENT SIMULATION	
OUTPUT 1	MEASURE
OUTPUT 2	MEASURE

6.2 LEVEL METER SETUP

[200] LEVEL METER SETUP
LEVEL
VOLUME
RELAY
CURRENT OUTPUT
COMMUNICATION SETUP

LEVEL

[210] LEVEL
SENSOR
UNIT

SENSOR

[211] SENSOR	
USE	ENABLE
SENSOR TYPE	LXD-10
EMPTY	00.00ft
DEAD ZONE	00.98ft
TX POWER	050
RX GAIN	093
TYPE	LEVEL
N. THRESHOLD	4[0.8V]
F. THRESHOLD	4[0.8V]
TEMP TYPE	INSIDE
TEMP FIX	°F
TEMP	°F
DAMPING	NORMAL
SOUND SPEED	0331.5
SOUND SPEED FACTOR	+0.60
LEVEL OFFSET	+0000.0ft

USE

This menu is for selecting the sensor use state.

[Default: Enable]

Range: Enable, Disable

SENSOR TYPE

This is the menu for selecting the type of sensor connected.

[Default: User Defined]

- (LXD-05) - N/A
- **S330 (LXD-10)**
- **S500 (LXD-15)**

EMPTY

Range:

Range: S330 - 33ft, S500 - 50ft

Sets the distance between the bottom of the sensor and the “0” level point.

DEAD ZONE

[Default: 01.00ft]

Range: 00.82 - 12ft

Sets the distance from the face of the transducer to the closest readable level.

TX POWER

Do not change from default unless measurement issues occur.

[Default: 050]

Range: 001 - 100

Adjusts the sensitivity of the signal output from the sensor.

- 10: Low Power - Use for short range applications
- 30: Normal Power - Use in normal conditions
- 50: High Power - Use in long range measurement
- 100: Maximum Power - Use in dusty, steamy or turbulent applications.

RX GAIN

[Default: 093]

Do not change from default unless measurement issues occur.

Adjusts the sensitivity of the signal received from the sensor.

Range: 000 - 100

- 30 or less: For use in non-standard short-range applications.
- 50: For use in non-standard semi-short-range applications.
- 80: For use in normal applications.
- 90: For use in long-range measurement
- 95: For use in long-range measurement dusty, steamy or turbulent applications.

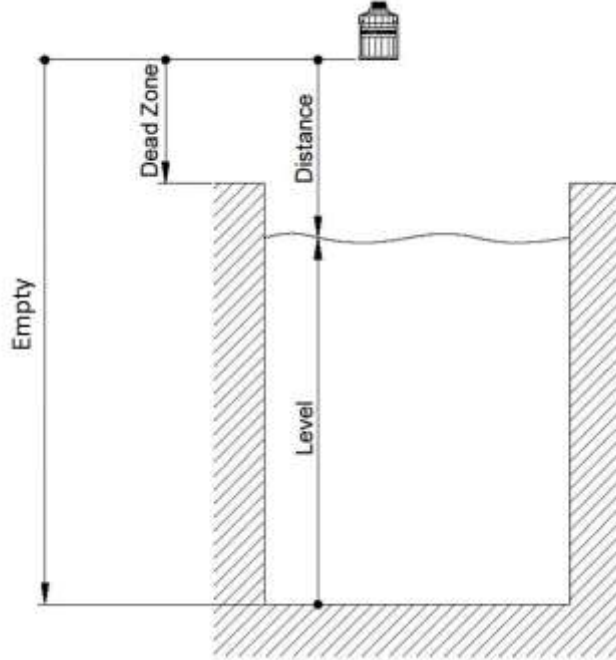
TYPE

This menu is for selecting the type of the measured value to be displayed in the measurement mode.

[Default: LEVEL]

Range:

- **DISTANCE**: display the distance to the measured object from the sensor bottom.
- **LEVEL**: display the distance to the measurement point from the floor.
- **SPACE**: display the distance to the measured object, excluding the DEAD ZONE
- **VOLUME**: display the capacity of the contents of the tank being measured (Volume)
- **DIFFERENTIAL**: display the difference between the measured value of the sensor channel 1 and the sensor channel 2.



N. THRESHOLD - Not Applicable

F. THRESHOLD

Do not change from default unless measurement issues occur.

[Default: 4[0.8V]

Range is 1-10

For noisy applications increase the detect threshold. For detection or weak signals, decrease the detect threshold value.

TEMP TYPE

[Default: INSIDE]

- INSIDE: Select when using the temperature inside the ultrasonic sensor.
- OUTSIDE: Select when using (optional) external temperature sensor.
- FIX: Select when desired temperature setting is fixed or constant.

TEMP FIX

[Default: °F]

Enter value manually for a fixed temperature.

TEMP

[Default: °F]

Displays current measured temperature reading.

DAMPENING

Do not change from default unless measurement issues occur.

[Default: NORMAL]

Range: SLOW, NORMAL, FAST, V FAST

Sets the displayed value response time.

SOUND SPEED

[Default: 0331.5 (Air)]

Sets the sound velocity to be changed according to the atmosphere the transducer is operating in.

Chlorine	206
Carbon dioxide	259
Argon	308
Oxygen	316
Air	331.5
Ammonia	415
Ethane	430
Neon	435
Helium	965

SOUND SPEED FACTOR

Do not change from default unless measurement issues occur.

[Default: +0.60]

LEVEL OFFSET

[Default: +0000.0ft]

Sets zero level offset from actual measured level.

UNIT

Value being measured.

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

TEMP UNIT

Range: °F, °C

[213] UNIT	
UNIT	ft
TEMP UNIT	°F

VOLUME

Sets the capacity of the contents of the tank.

[220] VOLUME
TYPE
VARIABLE
LEVEL TABLE
VOLUME TABLE
VOLUME SIMULATION

TYPE (TANK)

[Default: USER DEFINED]

Selection of tank shape.

- VERTICAL CYLINDER
- HORIZONTAL CYLINDER
- SPHERE
- USER DEFINED

[221] TYPE
TANK TYPE
HEAD TYPE
BOTTOM TYPE
USER DEFINED

HEAD TYPE

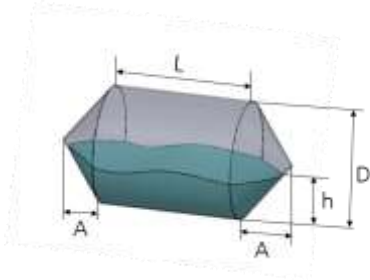
- CONICAL HEAD
- ELLIPSOIDAL HEAD
- GUPPY HEAD
- SPHERICAL HEAD
- FLAT HEAD

BOTTOM TYPE

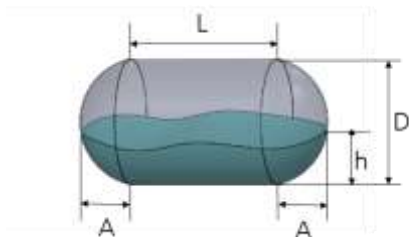
- FLAT BOTTOM
- CONICAL BOTTOM
- ELLIPSOIDAL BOTTOM
- SPHERICAL BOTTOM

USER DEFINED

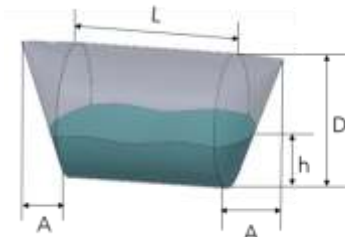
Horizontal Cylinder Tank Type



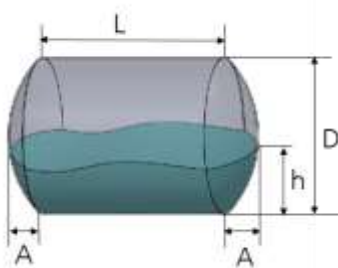
CONICAL HEAD TYPE



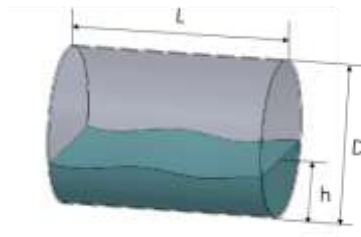
ELLIPSOIDAL HEAD TYPE



GUPPY HEAD TYPE



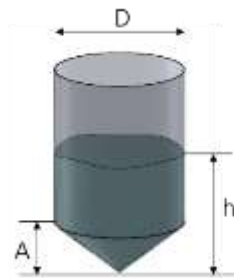
SPHERICAL HEAD TYPE



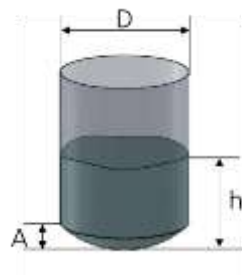
FLAT HEAD TYPE

- D: Diameter of the tank
- L: The length of the straight section
- A: Distance of HEAD
- h: Measured level

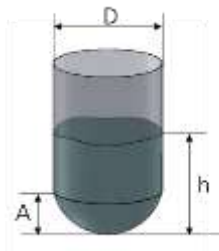
Vertical Cylinder Tank Type



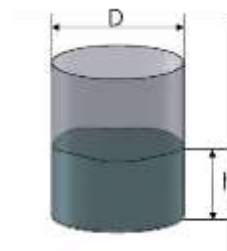
CONICAL BOTTOM TYPE



ELLIPSOIDAL BOTTOM TYPE



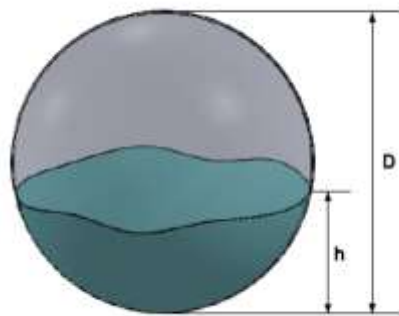
SPHERICAL BOTTOM TYPE



FLAT BOTTOM TYPE

D: Diameter of the tank
A: Distance of BOTTOM
h: Measured level

Sphere Tank Type



- D: Diameter of the tank
- h: Measured level

VARIABLE

[222] VARIABLE	
D	000.00ft
L	00.00ft
A	+00.00ft

D: Diameter of tank. If you use the SPHERE TANK, enter 2r as value.

L: Length of the straight section of the HORIZONTAL CYLINDER.

A: Length of the HEAD and BOTTOM of the VERTICAL CYLINDER and HORIZONTAL CYLINDER.

LEVEL/VOLUME TABLE

This menu is used when setting the type of tank as USER DEFINED.

- INDEX - Sets 30 point level/volume table.

LEVEL TABLE

[223] LEVEL TABLE	
INDEX 1	00.00ft ***
INDEX 30	00.00ft

VOLUME TABLE

[224] VOLUME TABLE [gal]	
INDEX 1	00000.0 ***
INDEX 30	00000.0

VOLUME SIMULATION

[225] VOLUME SIMULATION	
LEVEL	00.00ft
VOLUME	0.0 gal
MAX VOLUME	000.0 gal
RATIO	0.0

- LEVEL - used for setting the certain LEVEL value that is used to calculate VOLUME.
- VOLUME - used for the output the VOLUME value that is calculated by the LEVEL value that was entered.
- MAX VOLUME - used for the output the MAX VOLUME of the tank that is set currently.
- RATIO - used for the output the VOLUME and MAX VOLUME.

RELAY

[230] RELAY	
RELAY 1	
RELAY 2	
RELAY 3	
RELAY SIMULATION	

RELAY 1 - 3

[231-232] RELAY 1 - 3	
FUNCTION	NONE
OPERATE	SENSOR 1
GROUP	1
ON POINT	+00.00ft
OFF POINT	+00.00ft

FUNCTION:

Relay use state:

- NONE: Relay outputs not being used.
- LIMIT: Enables each relay independently via the ON/OFF set points
- ALTERNATE: Enables each relay to alternate in sequence via the measured value and the ON/OFF set points.
- ALARM: Enables relay via Fail Safe Time Alarm

OPERATE: SENSOR 1, SENSOR 2

GROUP: 1-3

ON POINT: [Default: ft]

OFF POINT: [Default: ft]

RELAY SIMULATION

[Default: RELAY 1, RELAY 2, RELAY 3 - OFF

Range: Test ON/OFF function of relay.

[237] RELAY SIMULATION	
RELAY 1	OFF
RELAY 2	OFF
RELAY 3	OFF

CURRENT OUTPUT

[240] CURRENT OUTPUT
CURRENT OUTPUT 1
CURRENT OUTPUT 2
CURRENT SIMULATION

CURRENT OUTPUT 1 and OUTPUT 2

[241-242] CURRENT OUTPUT 1 - 2	
4mA POINT SET	+00.00ft
20mA POINT SET	+00.00ft
ERROR	3.8mA

4mA - is used to enter the minimum level that the current output is 4mA

20mA - is used to enter the maximum level that the current output is 20mA

ERROR - is used for setting the operation of the current output when an error occurs

- 3.8mA
- 22mA
- HOLD

CURRENT SIMULATION

[243] CURRENT SIMULATION	
OUTPUT 1	MEASURE
OUTPUT 2	MEASURE

Range: Select current simulated value below for Current Output 1 and 2.

- 3.8mA
- 4mA
- 12mA
- 20mA
- 22mA

COMMUNICATION SETUP

[6000] COMMUNICATION SETUP
RS-232 SETUP
RS-485 SETUP

RS-232 Setup

RS-485 Setup

[6100] RS-232 SETUP	
USE	ENABLE
BAUD RATE	9600
PARITY	NONE
STOP BIT	1
DATA BIT	8
PROTOCOL	FLOMOTION

[6200] RS-485 SETUP	
USE	Enable
BAUD RATE	9600
PARITY	None
STOP BIT	1
DATA BIT	8
PROTOCOL	FLOMOTION

Range:

USE

This menu is for selecting the RS-232 use state.

- ENABLE [Default]
- DISABLE

BAUD RATE

This menu is for selecting the transmission speed of RS-232

- 4800 bps
- 9600 bps [Default]
- 14400 bps
- 19200 bps
- 38400 bps
- 57600 bps
- 115200 bps

PARITY

- NONE [Default]
- ODD
- EVEN

STOP BIT

Selects the size of the Stop Bit of RS-232 data transmission

- 1 bit [Default]
- 2 bit

DATA BIT

Selects the size of the transmission data of RS-232

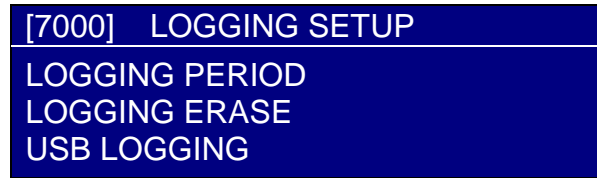
- 8 bit [Default]
- 9 bit

PROTOCOL

Selects the protocol that is output by RS-232

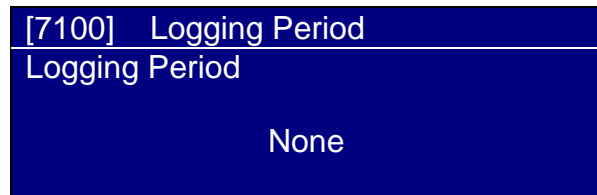
- Flomotion [Default]
- KICT

6.3 LOGGING SETUP



Logging Period

[Default: NONE]



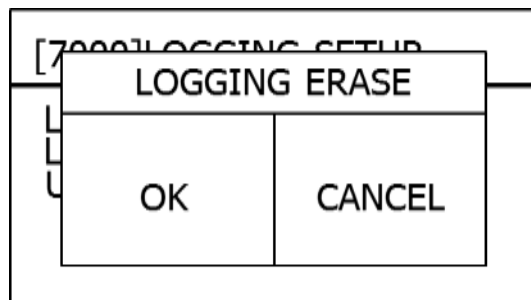
Range:

Data Logging Period	Maximum Storage 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

Maximum data logging memory (16,128 points)

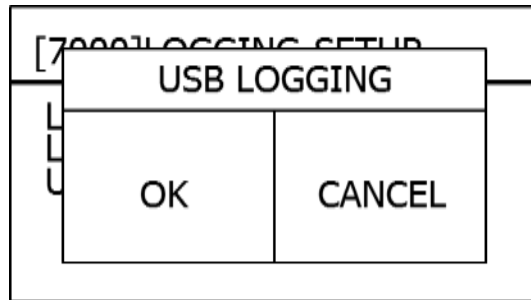
Logging Erase

Screen will be displayed as shown below. Selecting 'OK' will erase all logged data.

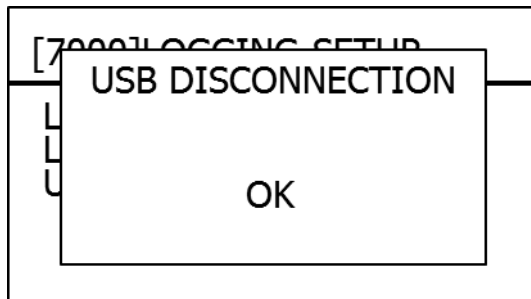


USB Logging

When USB is connected, screen will be displayed as below. By selecting OK, it transfers logged data to USB as EXCEL file.



When USB is not connected, screen will be displayed as below. Please connect USB, and then click the (enter) OK button, the error message will disappear.



6.4 SYSTEM SETUP



System Info

[410]	SYSTEM INFO
VERSION	1.1.4
SYSTEM ID	0
UNIT	FEET

- VERSION: Firmware version
- SYSTEM ID: System ID for Flomotion protocol
- UNIT: Engineering Unit Selected programmed by user.

System ID

[Default: 0]

Range: 0 - 99

Sets the System ID to be used for Flomotion Protocol.

Modbus ID

[Default: 001]

Range: 001 - 247

Sets the Slave ID required when using Modbus Protocol

[420]	SYSTEM ID
SYSTEM ID	0
MODBUS ID	001

System Time

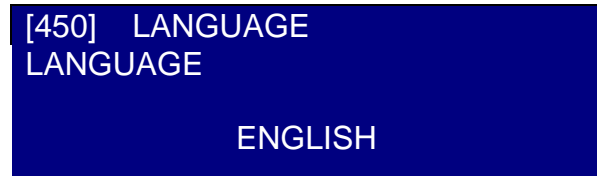
[430]	SYSTEM TIME
SYSTEM TIME	
	JAN/01/2013/05:54

Password

[Default: 0000] It is not recommended to change. If password is changed and forgotten, the meter will need to be sent back to the factory.

[440]	PASSWORD
PASSWORD	
	0000

Language



Fail Safe Time

[Default: 300 sec]

Range: 20 - 999

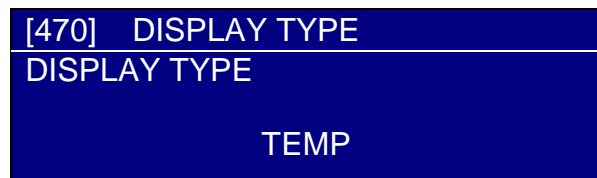
Sets the time the FAIL SAFE value is held.



Display Type

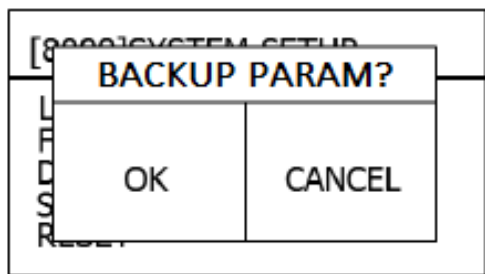
[Default: TEMP]

Range: TEMP, CURRENT



Backup Parameter

Accepts the user selected parameters.

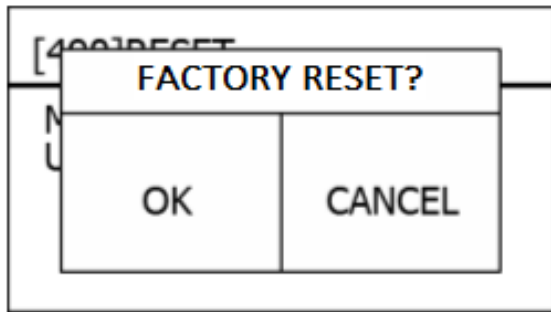


Reset



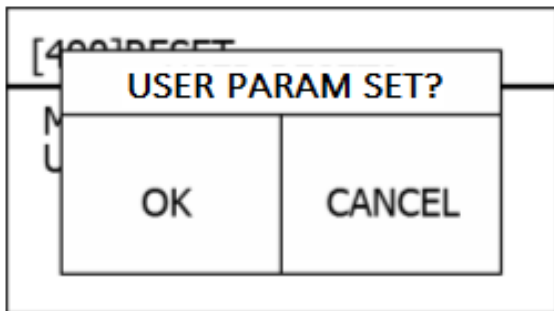
Factory Reset

Resets programming to the original factory settings.



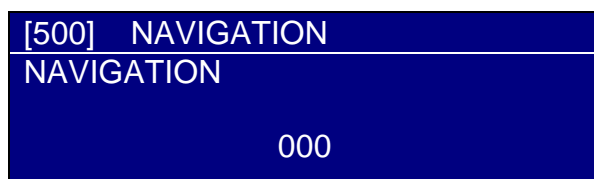
User Param Set

Resets programming to the user selected parameters if saved during setting backup function.



6.5 NAVIGATION

Allows for quick access to specific parameters directly by entering the preset number.



Ex) If you want to move to the menu of LOGGING PERIOD, enter menu number [310] and you can access menu immediately.

7. MAINTENANCE

Sensor - Inspect the face for dirt or debris. Wipe clean if necessary.

8. TROUBLESHOOTING - ERROR CODE LIST

E0101 E1101	Error appears when sensor 1 is not connected to the terminal or it is connected to the terminal incorrectly.
E0101 E2101	Error appears when sensor 2 is not connected to the terminal or it is connected to the terminal incorrectly.
E0102 E1102	Error appears when the built-in temperature sensor in sensor 1 is not operating properly.
E0102 E2102	Error appears when the built-in temperature sensor in sensor 2 is not operating properly.
E0401	Error appears when an external thermometer that connected to the controller is not operating properly.
E0201	Error appears when the flash memory inside controller is not operating properly.
E0202	(1) Error appears when the EPROM memory inside controller is not operating properly.
E0203	Error appears when the REAL TIME CLOCK inside of the controller is not operating properly.
E0204	Error appears when the received signal from sensor 1 is abnormal. "LE" will be flashing on the screen.
E0204	Error appears when the received signal from sensor 2 is abnormal. "LE" will be flashing on the screen.

9. RS-232/RS-485 PROTOCOL

9.1 Flomotion Protocol

Data Output Format

Data format is ASCII and the Data information is as follows:

Data field	DATA START					SYSTEM ID				YEAR
Byte number	1	2	3	4	5	6	7	8	9	10
Data		D	A	T	A		0	0		2
Data field	YEAR				MONTH			DAY		
Byte number	11	12	13	14	15	16	17	18	19	20
Data	0	1	3		1	2		0	3	
Data field	HOUR			MINUTE			SECOND		UNIT	
Byte number	21	22	23	24	25	26	27	28	29	30
Data	1	0		5	0		1	5		M
Data field	UNIT	LEVEL						FLOW RATE		
Byte number	31	32	33	34	35	36	37	38	39	40
Data		0	0	0	0	0	0		0	0
Data field	FLOW RATE					TOTAL FLOW				
Byte number	41	42	43	44	45	46	47	48	49	50
Data	0	0	0	0		0	0	0	0	0
Data field	TOTAL FLOW				TEMPERATURE UNIT		TEMPERATURE			
Byte number	51	52	53	54	55	56	57	58	59	60
Data	0	0	0	0		C		+/-	0	0
Data field	TEMPERATURE		DATA END							
Byte number	61	62	63	64	65					
Data	0	0		\n	\r					

The gray column in the table above means space (0*20).

Data Output (e.g.): 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

DATA

1. System ID
2. Year/Month/Day/Minute/Second
3. Measurement Unit
4. Level
5. Flow Rate
6. Total Flow
7. Temperature Unit
8. Temperature
9. Data End

UNIT	LEVEL	FLOW RATE	TOTAL FLOW
m	Meter	m ³ /h	m ³
c	Centimeter	m ³ /h	m ³
mm	Millimeter	m ³ /h	m ³
ft	Feet	GPM[US]	gal[US]
in	Inch	GPM[US]	gal[US]
yd	Yard	GPM[US]	gal[US]
°F	Fahrenheit		
°C	Celsius		

9.2 Modbus

The LM7000 provides Modbus RTU frame format and Modbus ASCII frame format. All data register codes are read holding registers. Modbus ID can be set from 1 to 247.

(Relevant menu SYSTEM SET-UP (8000) > SYSTEM ID > MODBUS ID)

Modbus DATA Register Table

TYPE	Description	START REGISTER		REGISTER OFFSET		REGISTER	DATA DESCRIPTION		R/W
		Hex	Decimal	Hex	Decimal				
ID	Product Code	8001	32769	8000	32768	1	0 = Level (LM7000) 10 = Flow (FM8000)		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) FM8000 Only	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/s] 5 = imperial gallons per minute [gal/m] 6 = US gallons per minute [gal/m] 7 = imperial million gallons per day [MGD] 8 = US million gallons per day [MGD]		R
	Temperature Unit	8004	32772	8003	32771	1	0 = °C 1 = °F		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	Instant Flow	float	R
	Maximum flow rate of the day	8023	32803	8022	32802	2	Highest Flow in a day	float	R
	Minimum flow rate of the day	8025	32805	8024	32804	2	Lowest Flow in a day	float	R
	Total Flow	8027	32807	8026	32806	2	Total Flow	float	R
	Total Hour	8029	32809	8028	32808	2	Total Hour	unit32	R
	Temp (inside)	802B	32811	802A	32810	2	Inside Temperature	float	R
	Temp (outside)	802F	32815	802E	32814	2	Outside Temperature	float	R

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

Modbus Register Data Type

- Data Field: 4 Byte Float Type
- ID, UNIT, Relay Field: Unsigned Short (2 byte) Type

10. ACCUVIEW SUPPORT SOFTWARE

10.1 Minimum Requirements

1. OS & Library
OS: Microsoft Windows XP or Windows 7 32bit/64bit
Library: Microsoft.net Framework v. 3.5, MS Chart for .net Framework 3.5 library
2. Hardware
CPU: 32bit or 64bit Intel Pentium 3 1 GHz
Memory: 256MB
Port: RS-232 port (when receiving the data from the control board through RS-232)

10.2 Program Installation

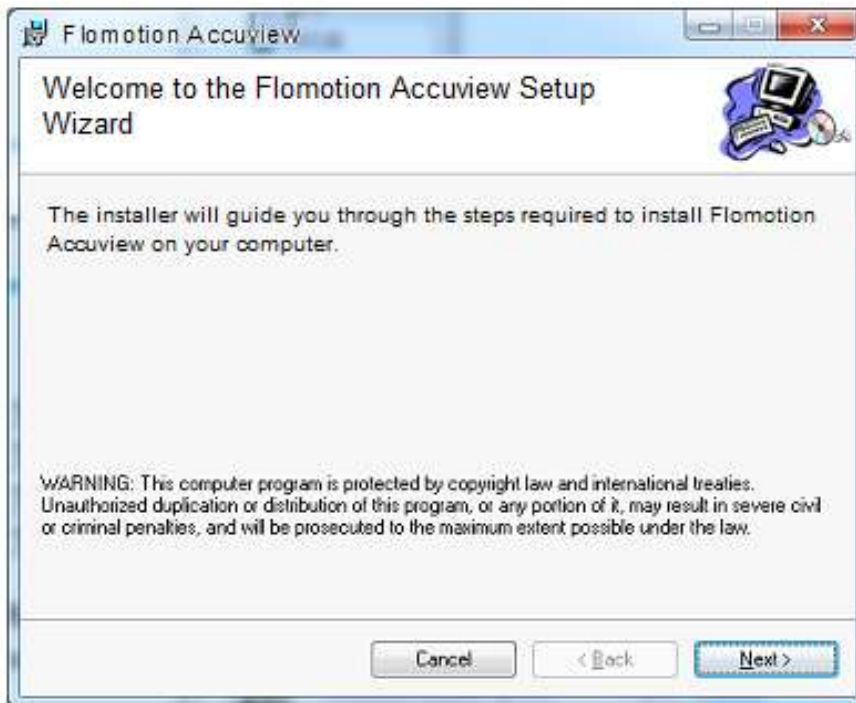
Installing Program File

The file is provided by the supplied CD or internet (flomotionsystems.com). Click the AccuviewInstaller.msi



Installing Process

Select the options in each process and click the [Next] button.

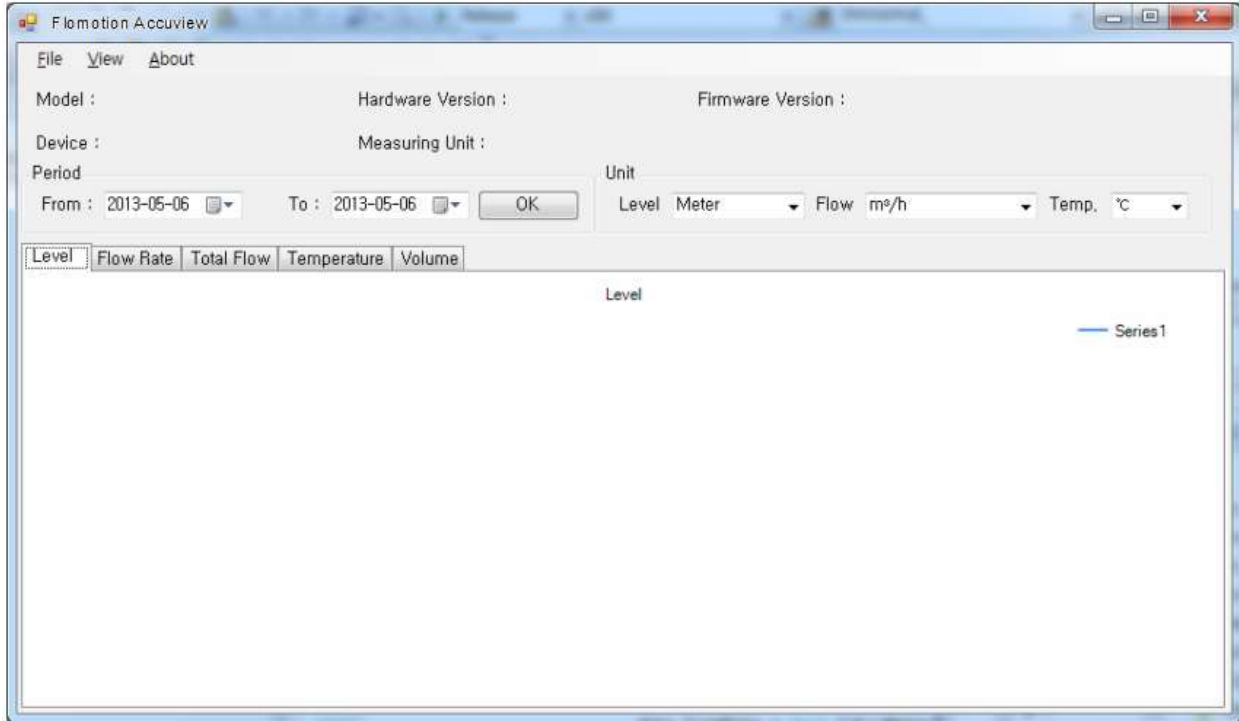


Running Program

The directory "Flomotion" is created in the computer. Click Flomotion Accuview.

10.3 Initial Display





10.4 File Menu

Open

The flow data format is CSV. This menu is to open the CSV files.

Save

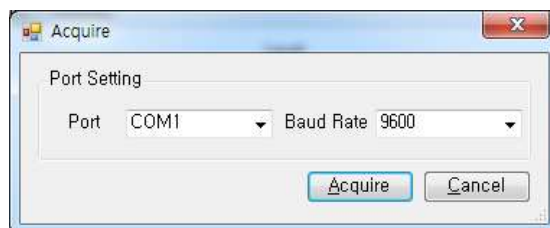
This menu is to save the flow data from LM7000 when it is connected with RS-232 port. The data is saved as CSV format. File name is made by the user.

Acquire

This menu is to acquire the data from LM7000 when it is connected with RS-232 port.

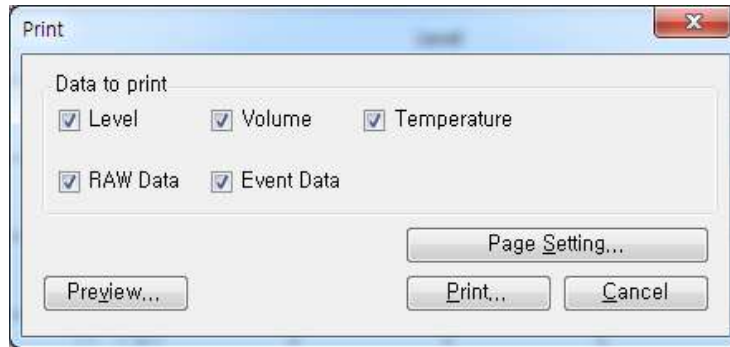
Port – Select COM Port to access with the device.

Baud Rate – Select the Baud Rate which set in menu 6100. If the Baud Rate is not identical with the selected rate in menu 6100, errors may occur.



Print

This menu is to print the selected file or the data from the device.



1. **Data To Print** – It is selection of data range such as Level, Volume, Temperature, Raw Data, and Event Data. Level, Volume, and Temperature are printed always horizontally.
2. **Page Setting** – Selection of paper size, layout, margin width, etc.
3. **Preview** – Selected data is previewed.
4. **Print** – Selected data is printed.

10.5 View

Raw Data - This menu is to view the raw data from the device.

Time	Level	FlowRate	TotalFlow	Temperature
2013-01-03 20:27:00	9.06 ft.	6.24 ft ³ /s	3.33 U.S. MG	77 °F
2013-01-03 20:27:10	9.06 ft.	6.24 ft ³ /s	3.33 U.S. MG	77 °F
2013-01-03 20:27:23	9.06 ft.	6.24 ft ³ /s	3.33 U.S. MG	77 °F
2013-01-03 20:27:33	9.06 ft.	6.24 ft ³ /s	3.33 U.S. MG	77 °F
2013-01-03 20:27:43	9.06 ft.	6.24 ft ³ /s	3.33 U.S. MG	77 °F
2013-01-03 20:27:54	9.06 ft.	6.24 ft ³ /s	3.33 U.S. MG	77 °F
2013-01-03 20:28:04	9.06 ft.	6.24 ft ³ /s	3.34 U.S. MG	77 °F
2013-01-03 20:28:14	9.06 ft.	6.24 ft ³ /s	3.34 U.S. MG	77 °F
2013-01-03 20:28:24	9.06 ft.	6.24 ft ³ /s	3.34 U.S. MG	77 °F
2013-01-03 20:28:34	9.06 ft.	6.24 ft ³ /s	3.34 U.S. MG	77 °F
2013-01-03 20:28:45	9.06 ft.	6.24 ft ³ /s	3.34 U.S. MG	77 °F
2013-01-03 20:28:55	9.06 ft.	6.24 ft ³ /s	3.34 U.S. MG	77 °F

Time – Shows the time when the data was logged. The format is Year/Month/Day, Hour:Minute:Second.

Level – Shows the level data.

Flow Rate – Shows the instant flow rate. (FM8000 Only)

Total Flow – Shows the Total Flow Rate by selected unit in Flow Rate menu. Please refer to the table as follows. (FM8000 Only)

e.g.) if the Flow Rate unit is selected m³/h, the Total Flow is displayed in m³ unit.

Temperature – Shows the temperature data.

FLOW UNIT	TOTAL FLOW UNIT
m ³ /h	m ³
m ³ /d	m ³
l/min	KL(Kilo Liter)
ft ³ /s	ft ³
GPM[US]	gal[US]
GPM[UK]	gal[UK]
MGD[US]	MGD[US]
MGD[UK]	MGD[UK]

Event Data – Shows the event data.

Time	RecordType	Menu ID	Param Value
2013-01-03 20:26:52	LogClear	0	0
2013-01-03 19:47:23	PowerOff	0	0

Time – Shows the time when the event data was logged.

Record Type – Shows the event classification.

Menu ID – Shows menu ID when the log type is Parameter Change Prev or Parameter Change Current.

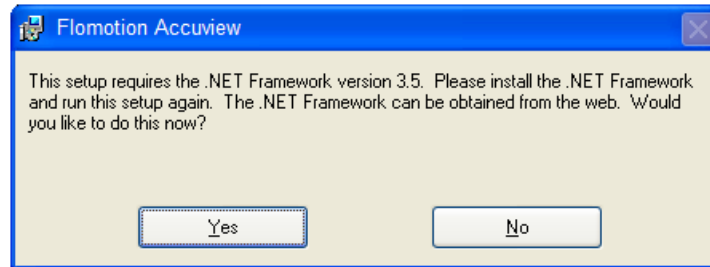
Param Value – Shows changed menu ID and original menu ID when the log type is Parameter Change Prev or Parameter Change Current.

10.6 About

This menu is the information of SW copyright and the contact number of the manufacturer.

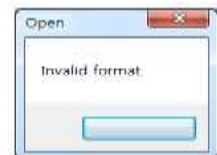
10.7 Trouble Shooting

Installation – When the library; .net framework 3.5 isn't installed in the computer, the message will be occurred as below.



Click the YES button, download .NET Framework 3.5 from Microsoft homepage. Reinstall Accuview program.

Open – If the file is not suitable for the SW, the error message shows as below. Check the file if it is log file from LM7000.



Acquire

No COM port was found -

When COM port is not found, the following error message is displayed.



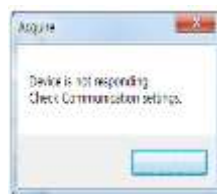
Device is not responding -

When not connecting with device, the following error message is displayed. Check the menu; Communication Setup (6100) of LM7000. It must be as follows. USE: Enable, PROTOCOL: Flomotion. Check the BAUD RATE of the LM7000 and the BAUD RATE of the Accuview software. It must be the same.



Device is not responding. Check Communication Settings.

When not connecting with device, the following error message is displayed. Check the menu; Communication Setup (6100) of the LM7000. It must be as follows: USE: Enable, PROTOCOL: Flomotion. Check the BAUD RATE of the LM7000 and the BAUD RATE of the Accuview software. It must be the same.





FLOW ~ LEVEL ~ CHEMICAL FEED
(800) 909-3569

Flomotion Systems, Inc.
165 Creekside Drive, Suite #112
Buffalo, New York 14228
Tel: 800-909-3569
Fax: 716-691-1253
www.flomotionsystems.com