FLOMOTION FM1100
Ultrasonic Level Monitor
USER'S MANUAL

March 1, 2013

Ultrasonic Level Monitor

FM1100 Series

USER'S MANUAL

FLOMOTION SYSTEMS, INC.

FM1100 SERIES

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Contents

Chapter 1 Introduction

About the FLOMOTION FM1100

The FLOMOTION FM1100 with sensor provides non-contacting level measurement for a wide variety of applications in both liquids and solids. The FM1100 system is comprised of an ultrasonic sensor and remote mounted controller that can be mounted up to 650 feet away from the level sensor.

Easy calibration and maintenance-free performance means you can install the FM1100 rapidly and with confidence.

The FLOMOTION FM1100 is ideally suited for a wide range of measurement applications such as wastewater pump stations, wet wells, ponds/reservoirs and chemical storage tanks.

Features

- Programmable analog output
- Menu driven programming
- 5 SPDT relays for alarms and external control
- RS485 or RS232C (Optional)
- Weather resistant and safe against submersion (NEMA 6)
- Automatic temperature compensation

Chapter 2 Product Specification

Physical

Controller Dimensions	9.45" (240mm) width x 7.3" (185mm) height
Weight	Nominal 6.6 lb (3kg)
S260 Sensor Dimensions	2.6" (67mm) dia x 5.2" (131mm) height
S400 Sensor Dimensions	3.3 (82mm) dia x 5.9" (152mm) height
Sensor cable length	33ft (10m) Std., Up to 650ft max.
Mounting	1"NPT
Sensor material	Polypropylene

Environmental

Rating	NEMA 6 (Sensor), NEMA 4X (Controller)
Temperature – Controller	-4 ºF to +140 ºF (-20 ºC to +60 ºC)
Temperature – Sensor	-4 ºF to +158 ºF (-20 ºC to +70 ºC)

Performance

Accuracy	0.2% of the measured range (S260)
Resolution	0.04" (1mm)
Range (Liquids)	S260: 1.2ft (0.35m) to 26ft (8m)
	S400: 1.6ft (0.5m) to 40ft (12m)
Beam Angle	8º at -3dB
Damping Rate	Adjustable from 0.1m/min to 100m/min
Temperature Compensation	Fully compensated via integral temperature sensor over entire operational span

Outputs

Analog output	4-20mA into Max 750꜒ (user adjustable) Fault condition Alarm 3.8mA or 21mA user selectable.
Display	2 Line 40 Characters LCD
Relays	5 SPDT, 5A, 250VAC

Programming

On-board programming   4 tactile push button keys

Supply

Power supply   AC 110 ~ 230VAC, DC 20-30VDC (opt)

Chapter 3 Installation

Power Supply Requirements

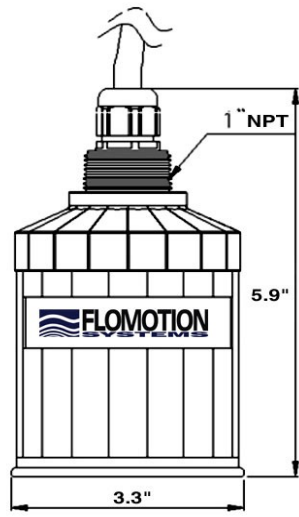The FM1100 Series operates from an AC supply of 110-230VAC or DC 20-30VDC.

> *All electronic products are susceptible to electrostatic shock, so follow proper grounding procedures during installation.*

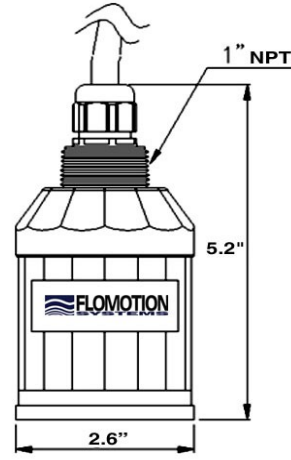The construction of the FM1100 Series can be mounted easily using the thread (1"NPT).

When choosing a location to mount the sensor, bear in mind the following:

- For easy access to the LCD display and programming buttons mount it where it is easily accessible.
- The ultrasonic signal path should be free of falling material and obstructions such as pipes, beams etc.
- The S260 sensor should be mounted at least 14 inches (35cm) above the maximum level of the material and be perpendicular to the surface. The mounting surface should be vibration-free.
- The S400 sensor should be mounted at least 19 inches (50cm) above the maximum level of the material and be perpendicular to the surface.
- The ambient temperature of the sensor is between -4 ºF to +158 ºF (-20 ºC to +70 ºC).
- There should be no high voltage cables or electrical inverters close by.
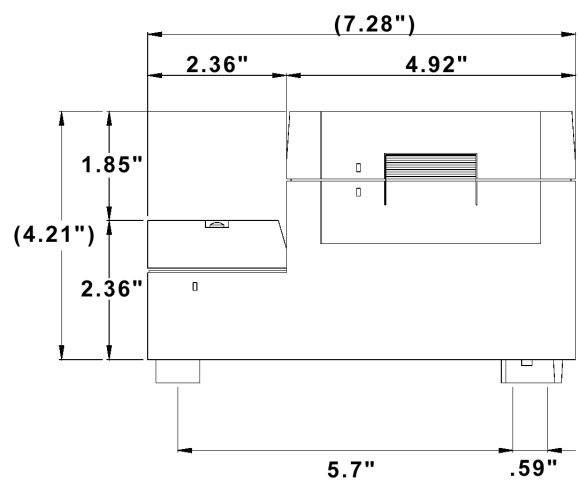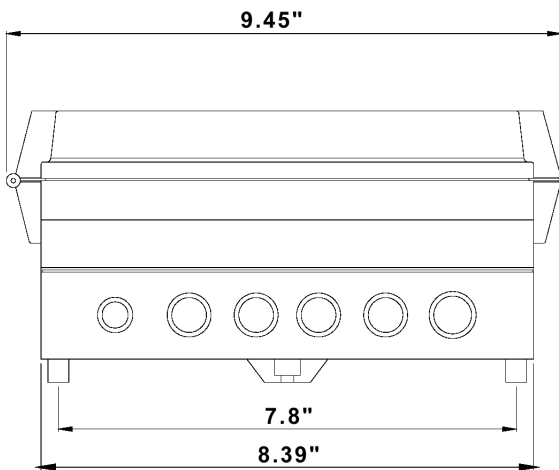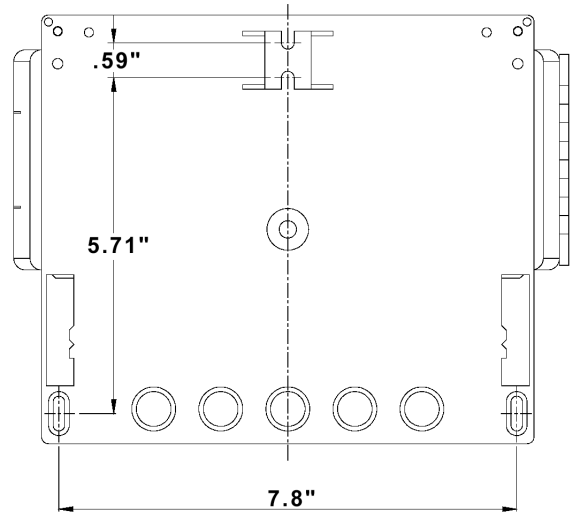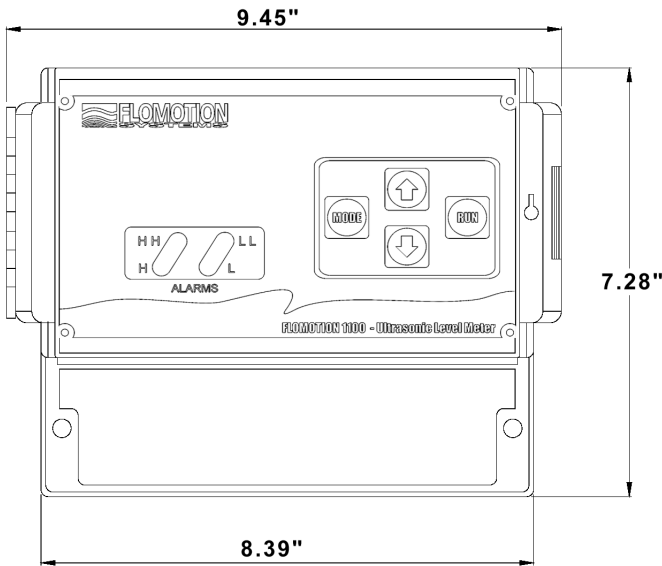- Do not use any metal substances when installing.

Dimensions

S400

S260

FM1100

Terminal Connection

Input & Output Terminals


```
TB1-1
 (1) (2) (3) (4) (5) (6) (7) (8)
  SENSOR    mA1    DIGITAL
 VCC SIG GND (+) (-)  Tx  Rx GND
 Rd Wh Blk
   Sensor

TB2
 (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20) (21) (22)
    RLY4(LL)       RLY3(L)       RLY2(H)       RLY1(HH)      ERROR
 NO COM NC  NO COM NC  NO COM NC  NO COM NC  NO COM

TB3
 (23) (24) (25)
  L2   L1   ⏚
    110V~230V
```
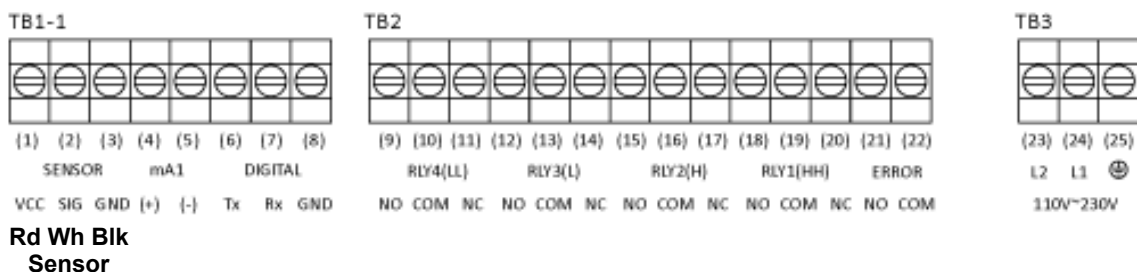
Terminal Functions

Terminal		Function	Note
VCC	1	Connect to positive wire(red) of ultrasonic sensor	
SIG	2	Connect to shield wire(white) of ultrasonic sensor	
GND	3	Connect to shield wire(black) of ultrasonic sensor	
mA+	4	4~20mA current output	Maximum :750Ω
mA-	5	Current output return	
TX	6	RS232C interface in use, connect to reception part RS485 interface in use, connect to Y	OPTION
RX	7	RS232C interface in use, connect to transmission part RS485 interface in use, connect to Z	OPTION
GND	8	GROUND, RX, TX	
RLY4_NO	9	Lower limit relay point, OFF with LL_COM together in operation	
RLY4_COM	10	Lower limit relay point, OFF with LL_NO together in operation	
RLY4_NC	11	Lower limit relay point, OFF with LL_COM together out of operation	
RLY3_NO	12	Lower Alarm relay point, OFF with L_COM together in operation	
RLY3_COM	13	Lower Alarm relay point, OFF with L_NO together in operation	
RLY3_NC	14	Lower Alarm relay point, OFF with L_COM together out of operation	
RLY2_NO	15	Upper Alarm relay point, OFF with H_COM together in operation	
RLY2_COM	16	Upper Alarm relay point, OFF with H_NO together in operation	
RLY2_NC	17	Upper Alarm relay point, OFF with H_COM together out of operation	
RLY1_NO	18	Upper limit relay point, OFF with HH_COM together in operation	
RLY1_COM	19	Upper limit relay point, OFF with HH_NO together in operation	
RLY1_NC	20	Upper limit relay point, OFF with HH_COM together out of operation	
ER_NO	21	Error relay point, OFF with ER_COM together in operation	
ER_COM	22	Error relay point, OFF with ER_NO together in operation	
L2	23	Connect to line of AC power	Option: DC ver.
L1	24	Connect to line of AC power	
⏚	25	Ground	

Quantity of cable hubs provided and cable thickness

Model	Quantity	Diameter (ø)
PG11	4	0.20 ~ 0.39" (5~10mm)
PG13.5	1	0.24 ~ 0.47" (6~12mm)

Outdoor and Open Vessel Installation

The sensor can be simply mounted on a bracket, suitable for the application and secured using the thread located at the top of the transducer (1" NPT).

Care should be taken to ensure that the sensors S260/S400 are not installed in direct sunlight, in order to avoid errors in the measurement of ambient temperature.

Attention should also be taken, when mounting the unit, to ensure that strong windy conditions are avoided, wherever possible, to prevent abnormal operation.

If conditions require that you use a metal mounting bracket to mount the sensor install rubber isolating gaskets between the sensor and the bracket to isolate mechanical vibrations in the bracket from the sensor which may cause unstable or erratic readings.

Closed Vessel Installation

The sensor can be simply screwed into a flange and secured using the thread located at the top of the transducer (1"NPT).

Where possible use a flange made of a synthetic material such as PVC, to avoid vibration.

Place a rubber gasket between the flange and the connection to the vessel to avoid vibration.
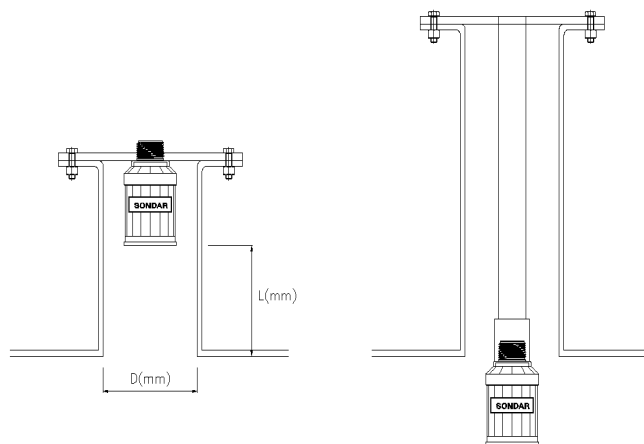
	Maximum Length	
Dia.	S260	S400
3" (80mm)	7.2" (180mm)	-
3.5" (100mm)	9.1" (230mm)	9.1" (230mm)
6" (150mm)	13.8" (350mm)	13.8" (350mm)
8" (200mm)	18.5" (470mm)	18.5" (470mm)

Stand Pipe Installation

When mounting the sensor to a standpipe care should be taken to ensure that the standpipe is of sufficient diameter with reference to its length, see the table below for details:

When using a standpipe, fixed to the top of a vessel, ensure that the open end of the standpipe is clear of any obstructions such as weld seams, gaskets etc. in order to avoid unwanted signal returns.

If using standpipes, which extend into the vessel, beyond the blanking distance, but not as far as the empty level, then the open end of the standpipe should be cut to an angle of 45°.

FLANGE(F)

PVC PIPE(V)
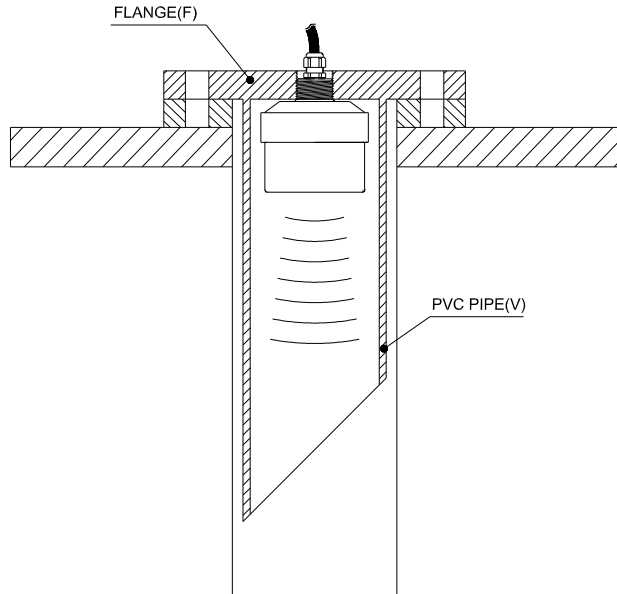
Chapter 4 How To Use The FM1100

Operating the Controller

Display Window

FM1100 is designed to display various data at the same time. The display below shows an example of a normal operation.

```
┌─────────────────────────────────────────┐
│   L: 6.44ft        D: 1.56ft    D T      │
│   M: 80.5%          T: +24.5 °C          │
└─────────────────────────────────────────┘
```
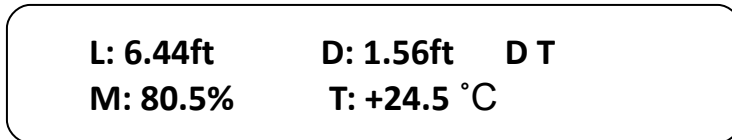
1) L: 6.44ft: shows the current liquid level
2) D: 1.56ft: shows the distance between the sensor bottom and the surface of the liquid.
3) M: 80.5%:   Percentage of the level in the storage.
4) T: Temperature at the sensor.
5) D: Indication of normal operation, shows returning echoes are well detected.
6) T: Indication of normal operation, shows tracking of returning echoes is okay.
7) S: No appearance under normal operation, but appears during abnormal operation such as abrupt level change. Searching for the returning echoes.

Setting Buttons
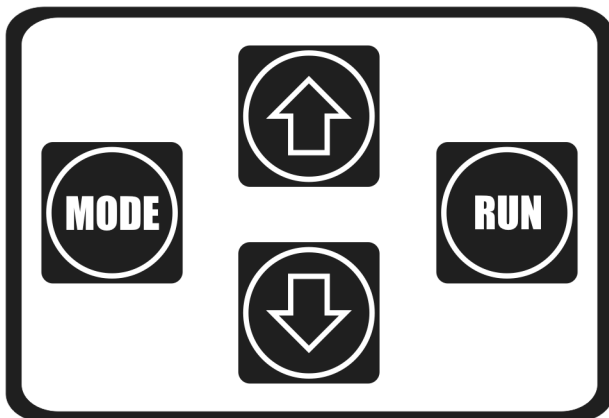
1) MODE Button : Used for entering program mode and saving values..
2) UP Button : Used for increasing the value.
3) DOWN Button : Used for decreasing the value.
4) RUN Button : Used for starting measurement.

Alarm Display
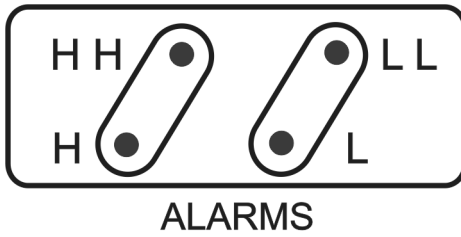
ALARMS

1) HH LED Lamp : Lighted in case of upper limit
2) H LED Lamp : Lighted in case of upper alarm
3) L LED Lamp : Lighted in case of lower alarm
4) LL LED Lamp : Lighted in case of lower limit

Program Mode
To enter programming mode press the the MODE button. Use the UP or DOWN arrows to make a selection.
Press the MODE button to save your changes.

Chapter 5 Menu Guide

Option Details			Entered Value				
Main Menu							
No.	Description	Range	Factory Settings	1	2	3	4
00	SENSOR TYPE	8M/12M/15M	8M				
01	MEASURE TYPE	LEVEL / DISTANCE / SPACE	LEVEL				
02	BOTTOM DISTANCE	0.00~26.0 ft (40.0 ft)	26.24 ft				
03	DEAD BAND	0.00~0.98 ft (1.47 ft)	0.98 ft				
04	4mA POINT	0.00~26 ft (40 ft)	0.00 ft				
05	20mA POINT	0.00~26 ft (40 ft)	26 ft				
06	TRANSMIT POWER	1 ~ 5 (weak // strong)	3 (NORMAL)				
07	DETECT THRESHOLD	4 ~ 15	6 (0.6V)				
08	DAMPING RATE	0.01 ~ 100.0 m/min	1 (NORMAL)				
09	ERROR CURRENT SET	3.8mA / Hold / 21.0mA	3.8 mA				
10	FAIL SAFE TIME	20 ~ 999	300 sec				
11	mA OUTPUT TEST	HOLD / 3.8 / 4 / 12 / 20 / 21mA	HOLD				
12	DISTANCE UNIT	m(METER) / ft(FEET)	Ft (FEET)				
13	DETECT ALGORISM	FIRST ECHO / MAX ECHO	FIRST ECHO				
14	SOUND SPEED	0 ~ 999	331.5 m/s				
15	SPEED FACTOR	0 ~ 999	0.60m/ □				
16	MATERIAL TEMP	0 ~ 999	25.0 □				
17	MATERIAL T. WEIGHT	0 ~ 100%	0%				
18	PASSWORD CHANGE	0 ~ 999	0				
19	MASTER RESET	-	-				
Relay Menu							
01	RLY1(HH) ON POINT	0.00~26 ft (40 ft)	26.24 Ft				
02	RLY1(HH) OFF POINT	0.00~26 ft (40 ft)	13.12 Ft				
03	RLY2(H) ON POINT	0.00~26 ft (40 ft)	26.24 Ft				
04	RLY2(H) OFF POINT	0.00~26 ft (40 ft)	13.12 Ft				
05	RLY3(L) ON POINT	0.00~26 ft (40 ft)	26.24 Ft				
06	RLY3(L) OFF POINT	0.00~26 ft (40 ft)	13.12 Ft				
07	RLY4(LL) ON POINT	0.00~26 ft (40 ft)	26.24 Ft				
08	RLY4(LL) OFF POINT	0.00~26 ft (40 ft)	13.12 Ft				
09	RLY1 TOGGLE	RELAY1 ON/OFF	-				
10	RLY2 TOGGLE	RELAY2 ON/OFF	-				
11	RLY3 TOGGLE	RELAY3 ON/OFF	-				
12	RLY4 TOGGLE	RELAY4 ON/OFF	-				
13	ERROR RLY TOGGLE	ERR RELAY ON/OFF	-				

Note: When menu 19 "Master Reset" is used the settings are returned to the Factory Settings shown above.

Menu settings

Press MODE key

```
COMMON MENU: [ UP]
RELAY MENU:      [DOWN]
```

Select UP

00) Sensor Type

```
00. SENSOR TYPE
*TYPE – 8M
```

This option sets the sensor range. According to the measuring range, the sensor can be selected in three different kinds.

Option	Description
8m (S260 Sensor)	Measuring range up to 26 feet
12m (S400 Sensor)	Measuring range up to 40 feet
15m (not used)	

01) Measure Type

```
01.  MEASURE TYPE SET
*LEVEL
```

This option sets the mode of operation when in run mode, and can be set to one of the following:

Option	Description
Level	Display shows how full the vessel is with respect to the **Empty** (0% of Span)
Distance	Display shows the distance from the transducer face to the surface.
Space	Display shows how an empty vessel is with respect to **Full** (100% of Span) i.e. how much space is available in the vessel.

- According to the choice of the option, the distance set point can be changed by the current output or relay output so that if the measure mode is changed, the distance value should be set again.
- From here the instruction is given based on the Level option.

02) Bottom Distance

```
02. BOTTOM DISTANCE SET

* BOT : 26.24 ft
```

This option sets the maximum distance from the face of the transducer to the empty point.

Transducer	Setting range	Factory set
S260	0.98 – 27.9 ft	26.2 ft
S400	1.47 – 41.0 ft	33.4 ft

03) Dead Band

```
03. DEAD BAND

*DEAD: 1.14 ft
```

The transducer must be installed higher than maximum level. It is the distance between the maximum level and the face of the transducer.

Transducer	Setting range	Factory set
S260	0.98 – 27.9 ft	1.14 ft
S400	1.47 – 41.0 ft	1.47 ft

04) 4mA Set point

```
04. 4mA POINT

*4mA : 0.00 ft
```

This option sets the distance (or level or space, depending on the selected **Measure Type** at which the 4mA output will occur. By default 4mA will represent **Empty** (0% of Span).

Transducer	Setting range	Factory set
S260	0 – 27.9 ft	0.00ft
S400	0 – 41.0 ft	0.00ft

05) 20mA Set point

```
05. 20mA POINT SET
*20mA : 26.0 ft
```

This option sets the distance (or level or space, depending on the selected **Measure Type** at which the 20mA output will occur. By default 20mA will represent **Full** (100% of Span)

Transducer	Setting range	Factory set
S260	0 – 27.9 ft	26.2 ft
S400	0 – 41.0 ft	33.4 ft

Important Information
The Span **is the maximum working distance from** Empty **(0%) to** full **(100%), and is automatically calculated as** Empty Level **(Bottom Distance)** minus Blanking Distance. **Except for when Measure type = Distance** in this case the Span is the same **as the** Empty Level

06) Transmitting Power

```
06. TRANSMITTING POWER
*POW : 3(NORMAL)
```

This option is used to set the power output from the transducer to suit varying applications. By reducing the power emitted the beam angle will be effectively reduced and can be applied as detailed below;

- Setting Range:
  - 1 (V WEAK) = Minimum Power (For use on short range applications)
  - 2 (WEAK) = Low Power (For use on applications where obstructions such as pipes, beams, etc. are present)
  - 3 (NORMAL) = Normal Power (For use in normal condition)
  - 4 (STRONG) = High Power (For use in difficult applications where conditions are dusty, steamy or turbulent)
  - 5 (V STRONG) = Maximum Power (For use in the applications to be expected diffused reflection)

07) Detection Threshold Voltage

```
07. DETECTION THRESHOLD
*LEV : 1 (0.1V)
```

This is an option for setting threshold for detection of the reflected wave. This option determines the detectable size of the return echo. This is useful when the first return echo is mixed in with echoes from smaller objects or obstructions located near the path of the sound wave.

To reduce the probability of false detection or at an environment generating lots of noise, increase the threshold value. For detection of weak signals, decrease the value. In this way, set the threshold value according to the environmental conditions. The default value is 6. (Setting range: 4 – 15)

Transducer	Setting range	Factory set
S260/S400	1(0.1V) -15(1.5V)	1

08) Damping Rate

```
08. DAMPING RATE
*1.0 m/min
```

This option determines the maximum rate at which the unit will respond to an increase/decrease in level. Lower values give a slower, smoother response to variations in level. Higher values cause the meter to react quicker to variations in level.

- Setting Range: 0.01 ~ 100.m/min (step:0.01)

09) Error Current Set

```
09. ERROR CURRENT SET
*SET: 3.8mA
```

If the S260/S400 fails to receive a valid echo return from the target, then the mA output can be used to indicate a fault condition (Lost of Echo)

Transducer	Setting option	Factory set
S260/S400	3.8mA	3.8mA
	HOLD	
	21.0mA	

10) Fail Safe Time

```
10. FAIL SAFE TIME
*TIME: 300 sec
```

In the event of a fail-safe condition occurring (Lost of Echo) the fail safe timer determines the time before the mA output indicates a fault condition (Lost of Echo)

Transducer	Setting range	Factory set
S260/S400	20 - 999	300

11) mA Output Test

```
11. mA OUTPUT TEST
*OUTPUT: HOLD
```

This option is used with other equipments for testing.

Transducer	Setting range	Factory set
S260/S400	HOLD (Current output)	HOLD
	4mA	
	12 mA	
	20 mA	
	3.8 mA	
	21 mA	

12) Distance Unit Setting

```
12. DISTANCE UNIT
*UNIT: Ft (FEET)
```

This option determines system unit

Transducer	Setting range	Factory set
S260/S400	M(METER)	Ft(FEET)
	Ft(FEET)	

13) Detection Algorithm

```
13. DETECT ALGORITHM
*TYPE: FIRST ECHO
```

This option determines the echo when there are many echoes reflected.
If "FIRST ECHO" is set, it will detect the first returned echo.
If "MAXIMUM ECHO" is set, it will detect the maximum echo among the returned echoes.
However, this method is used on the condition that the difference in voltage between the maximum echo and other echoes should be less than 0.5V. This method is useful where smaller objects are near the target.

Transducer	Setting range	Factory set
S260/S400	FIRST ECHO	FIRST ECHO
	MAX ECHO	

14) Sound Speed

```
14. SOUND SPEED
*SPEED : 331.5 m/s
```

This option allows for the velocity of sound to be changed according to the atmosphere the transducer is operating in. By default the velocity is set for sound traveling in air at a temperature of $0^{\circ}C$.

The table below gives details of the velocity of sound in various gaseous atmospheres. In all cases the velocity indicated is that in a 100% gaseous atmosphere at $0^{\circ}C$. In atmospheres less than 100% it may be necessary to check the level indicated at near empty and near full and compare with the actual level, several times, then adjust the **Sound Speed** accordingly to obtain an accurately displayed reading.

Gas	Sound Velocity
Chlorine	206 m/sec
Carbon Dioxide.	259 m/sec

Argon	308 m/sec
Oxygen	316 m/sec
Air	331.5 m/sec
Ammonia	415 m/sec
Methane	430 m/sec
Helium	435 m/sec
Neon	965 m/sec

15) Speed Factor

> **15. SPEED FACTOR**
> ***FACTOR : 0.60m/°C**

The sound speed in air increases or decreases at fixed rate (0.6m/ ☐). This option allows the rate of change in m/°C to be set according to the present atmosphere and temperature. This option is useful where ambiguous or mixed gas exists. The newly set value should be compared with the actual level, several times, to obtain an accurately displayed reading.

 - Setting Range : -2.0m/ °C ~ 2.0m/ °C

16) Material Temperature

> **16. MATERIAL TEMP**
> ***TEMP : 25.0°C**

The S260/S400 uses an internal temperature sensor, housed inside the transducer nose cone and therefore the temperature used for compensation is the temperature close to sensor. In applications where there is a large difference between the temperature near the sensor and that at the surface of the material being measured, errors in measurement may occur. This mode allows for the present temperature at the material surface to be entered and reduces any error in measurement.

-        Setting Range: 0~70.0°C

-

17) Material Temperature Weighting

> **17. MATERIAL T WEIGHTING**
> ***WET : 0%**

This option is used in conjunction with **Mode 16, Material Temperature.** This option determines the effect the material temperature has on the air temperature in front of the transducer. Where the temperature of the material has no effect on the air temperature. **Mode** 17 should be set to **0,** in which case **Mode 16, Material Temperature** will be ignored. However in cases where the material temperature heavily influences the temperature at the transducer **Mode 17** should be set to **100** and

temperature compensation will be performed accordingly.
 - Setting Range: 0~100

18) Password Change

```
18. PASSWORD CHANGE
*PASSWORD: 0
```

This option allows changing the password. **The factory password set is "0".** The available number is "0" to "999". If the password is forgotten, please request to the manufacturer.

19) Master Reset

```
19. MASTER RESET
*RESET
```

This option makes all setting value into the factory setting value. If this option is applied, all setting values are reset. **Before reset, pay attention to note the current setting values for the reference.**

Select Reset with "mode" key, after showing "*" press "up" or "down" key. When [Run] shows, press "Run" key, all setting values are reset.

```
19. MASTER RESET
*RESET [RUN]
```

Relay menu setting

Press MODE key

```
COMMON MENU: [ UP]
RELAY MENU:      [DOWN]
```

Select DOWN

```
==== RELAY MENU ====
01. ALT. RELAY SET
02. FIXED RELAY SET
03. RELAYS TEST
```

01. ALT. RELAY SET – NONE – Not Used at this time.

02. FIXED RELAY SET

1) RLY1(HH) Point Setting

```
02. FIXED RELAY SET
*(1) R1 ON : 4.03f
```

This option determines the high limit "ON" point for HH relay

Transducer	Setting range	Factory set
S260	0 – 27.9 ft	26.25 ft
S400	0 – 41.0 ft	39.37 ft

2) RLY1(HH) OFF Point Setting

```
02. FIXED RELAY SET
*(2) R1 OFF : 2.29f
```

This option determines the high limit "OFF" point for HH relay

Transducer	Setting range	Factory set
S260	0 – 27.9 ft	13.12 ft
S400	0 – 41.0 ft	19.69 ft

3) RLY2(H) ON Point Setting

```
02. FIXED RELAY SET
*(3) R2 ON : 26.24f
```

This option determines the "ON" point for H switched output

Transducer	Setting range	Factory set
S260	0 – 27.9 ft	26.25 ft
S400	0 – 41.0 ft	39.37 ft

4) RLY2(H) OFF Point Setting

```
02. FIXED RELAY SET
*(4) R2 OFF : 12.13f
```

This option determines the "OFF" point for H switched output

Transducer	Setting range	Factory set
S260	0 – 27.9 ft	13.12 ft
S400	0 – 41.0 ft	19.69 ft

5)RLY3(L) ON Point Setting

```
02. FIXED RELAY SET
*(5) R3 ON : 26.24f
```

This option determines the "ON" point for L switched output

Transducer	Setting range	Factory set
S260	0 – 27.9 ft	9.84 ft
S400	0 – 41.0 ft	39.37 ft

6) RLY3(L) OFF Point Setting

```
02. FIXED RELAY SET
*(6) R3 OFF : 13.12f
```

This option determines the " OFF" point for L switched output

Transducer	Setting range	Factory set
S260	0 – 27.9 ft	13.12 ft
S400	0 – 41.0 ft	19.69 ft

7) RLY4(LL) ON Point Setting

```
02. FIXED RELAY SET
*(7) R4 ON : 26.24f
```

This option determines the low limit "ON" point for LL relay

Transducer	Setting range	Factory set
S260	0 – 27.9 ft	26.25 ft
S400	0 – 41.0 ft	39.37 ft

8)RLY4(LL) OFF Point Setting

```
02. FIXED RELAY SET
*(8) R4 OFF : 13.12f
```

This option determines the low limit "OFF" point for LL relay

Transducer	Setting range	Factory set
S260	0 – 27.9 ft	13.12 ft
S400	0 – 41.0 ft	19.69 ft

```
03. RELAYS TEST
*(1) RLY1:
```

From menu 09 to menu13 determines the relay on/off tentatively for the relay test.

03. RELAYS TEST
1)RELAY1 TOGGLE

2)RELAY2 TOGGLE

```
03. RELAYS TEST
*(2) RLY2:
```

3)RELAY3 TOGGLE

```
03. RELAYS TEST
*(3) RLY3:
```

4)RELAY4 TOGGLE

```
03. RELAYS TEST
*(4) RLY4:
```

5)ERROR RELAY TOGGLE

03. RELAYS TEST
*(5) ERROR:

Important Information
The value of **HH relay ON point** should be higher than **OFF point** and this function is used for high limit.
The value of **LL relay ON point** should be lower than **OFF point** and this function is used for low limit
H, L relay are used for **pump control, draining control, high and low liquid level warning, etc.** at user's need.

Chapter 6 Digital Communication

The FM1100 Series provides RS232/485 digital communication interface function as option

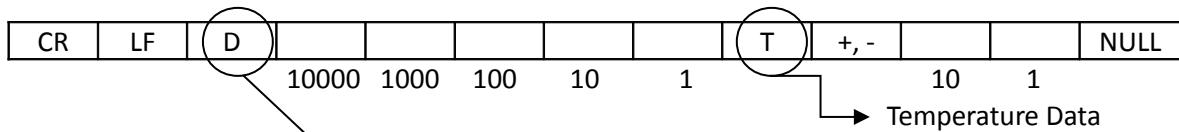The kinds of data and its format are as follows;

<u>**Output Data**</u>

1. **Kinds of Output Data**

    1) Distance Data
        - Distance from the sensor to the surface of measuring material. Unit is mm

    2) Temperature Data
        - This is temperature data measured by built-in temperature sensor. Unit is 1°C

2. **Data Format**

    Data is edited by ASCII and the sequence as follows

CR	LF	D						T	+, -			NULL
			10000	1000	100	10	1			10	1	

Temperature Data

D: Distance data. L: Level data
S: Space data   E: Error occurs

A. Baud Rate is 4800bps

B. 1 Data Frame consists of Total 13byte

C. Data Frame outputs per second

D. The number located at 10000 means 10000mm digit number

E. +/- means above/below zero in temperature. The number located at 10 means 10 degree digit number in °C/°F

Chapter 7 Troubleshooting

This section describes some problem symptoms, with suggestions as to what to do.

Symptom	What to Do
Display blank, transducer not firing.	Check power supply
Display shows "S", " ERROR! LOST ECHO"	"S" means there is an abrupt liquid change or an obstacle in the beam path is detected. Check the obstacle and get rid of it.
Display shows " BOTTOM SET ERROR".	Measuring range is bigger than setting data of maximum range. Go to 03, and set the bigger bottom distance
LE blink	Check the sensor installation on the suitable place and whether the dept of bottom is over than the setting range or an obstacle in the beam path is detected. Check the obstacle and get rid of it.