Operation manual

Ultrasonic interface level meter

HL2000

Honda Electronics Co., Ltd

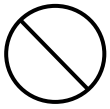
Table of contents

- Precautions to use

The following safety system symbols and instructions are given to protect the user from injury or damage to assets through proper use of product.

See the following symbols and instructions.

WARNING	In correct use by neglecting this indication may cause death or serious injury.
CAUTION	Incorrect use by neglecting this indication may possibly cause injury or physical damage.

 means prohibition through operating.

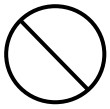
 means anything have to do.

Observe strictly

To use this equipment safety, comply with the following.

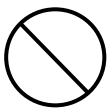
WARNING

・If smoke or fumes are emitted or any other abonormality is found, immediately shut down the power supply. When smoke emissions cease, ask the dealer of your equipment for repair.



・Don't alter this product. Otherwise, electric shock may be caused as this product contains high-voltage parts. In the case of failures, ask the dealer of your equipment for repair.

CAUTION



・Do not give a great impact to the product or drop it.

1. The general

- Ultrasonic interface level meter transmits ultrasonic waves from the sensor and receives the ultrasonic reflection waves from the interface. Ultrasonic interface level meter measures the propagation time between transmitting and receiving and calculates the distance from the sensor to the interface.
- This operation manual is written about the proper method for using HL2000 and precautions for use of HL2000.
  Therefore, read this operation manual firmly before using HL2000.

2. Warranty

- Anytime, it is no matter that under warranty or not, our company can't warrant the direct or and consequential loss or opportunity loss or accident compensation by our products with unassignable reason to us.

- In case of predicting big accidents or loss, the user must do safety measures (back up or fail safe) by user's self.

3. Others

- Use the wash nozzle or blush the surface of the sensor by the soft cloth to keep the sensor clean always because measuring the interface level is affected by the dirt of the surface of the sensor.

- Don't use the things which have fear to injure the surface of the sensor to clean it because the sensor is very delicate. And also, don't use the chemicals to clean the surface of the sensor.

- If the controller of HL2000 is installed at locations which receive directive sunlight, we recommend to cover the controller to protect from the sunlight.

- Ask the maker or the dealer before using the product because it may not be available to use, it depends on the ambient place.

- Ask the expert in the product to set the parameters at the installed place. If the adjustment is carried out by the customer and the big trouble happens, we can't assume full responsibility for the trouble.

4. Installing the sensor

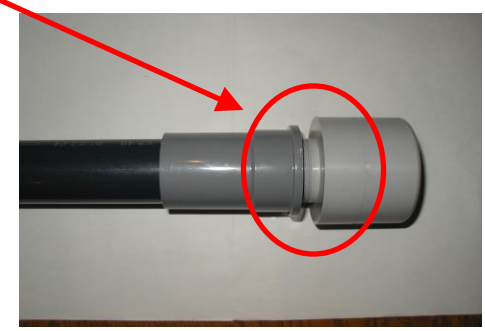
4-1 Procedure of installing the sensor to the pipe

・Prepare a pipe cut PF1 1/2 screw at the edge of the pipe.

・Put sensor cable into the pipe and then screw in the pipe to the sensor.

① Socket with the female screw is glued with the chloroethene pipe by the bond for chloroethene. (See the right chart.)

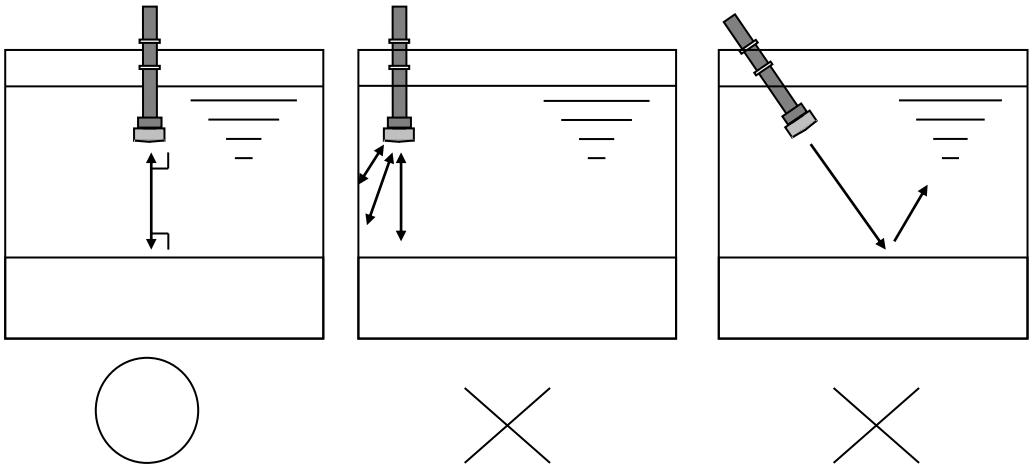
② Put the sensor cable into the pipe and insert the pipe put the sensor cable to the female screw of the socket with the female screw.



* Be careful not to stick the bond for the chloroethene pipe to the sensor cable. If the bond is stuck to the sensor cable, the sensor cable would be melted by the bond.

・Fix the pipe paralleled the surface of the sensor with the surface of water. In this case, soak the sensor into water. Also, don't install the sensor slantingly.

・Avoid to fix the sensor at the side of the tank because the ultrasonic reflection waves from the side of the tank.



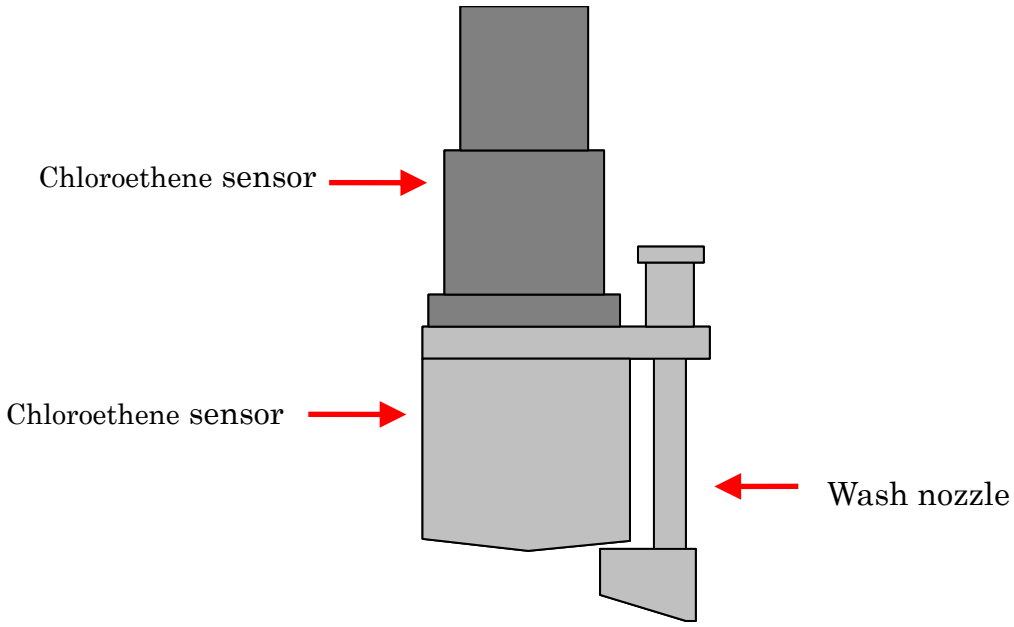
4-2 How to wash the sensor

・Because the dirt of sensor prevents from measuring interface level, keep always the sensor clean by the wash nozzle. (We have the wash nozzle as an essential option in our product line.)

・Run water through the wash nozzle. (The recommended water supply quantity: 20L/min)

・If it is impossible to install the wash nozzle for some reason, wash the sensor temporary and keep the sensor clean, always.
(Be careful not to break out the sensor because the sensor is very delicate when washing sensor.)

・In the unlikely event that HL2000 measures the interface level wrongly because of the dirt of the sensor, we can't assume responsibility for any damage.



5. Wiring

5-1 Placement of the terminal block

See the chart below about the numbers of terminal block. The lower block has (1)～(17), the upper block has 18～34.

(18) (34)

(1) (17)

See the chart below about wiring to each terminal.

1	Power supply	18	RELAY 1 (A)
2	Power supply	19	RELAY 1 (B)
3	F.G.	20	RELAY 1 (C)
4	NC	21	RELAY 2 (A)
5	SENSOR 1 (+)	22	RELAY 2 (B)
6	SENSOR 1 (−)	23	RELAY 2 (C)
7	SENSOR 1 (TH+)	24	RELAY 3 (A)
8	SENSOR 1 (TH−)	25	RELAY 3 (B)
9	SENSOR 1 (GND)	26	RELAY 3 (C)
10	SENSOR 2 (+)	27	RELAY 4 (A)
11	SENSOR 2 (−)	28	RELAY 4 (B)
12	SENSOR 2 (TH+)	29	RELAY 4 (C)
13	SENSOR 2 (TH−)	30	4-20 mA OUT 1 (+)
14	SENSOR 2 (GND)	31	4-20 mA OUT 1 (−)
15	RS-232C Tx	32	4-20 mA OUT 2 (+)
16	RS-232C Rx	33	4-20 mA OUT 2 (−)
17	GND	34	NC

5-2 Wiring to power supply

Connect AC power supply to (1) and (2) of terminal block.

The power supply voltage is AC85 ～240V 10VA.

Connect FG(Frame Ground) to (3).

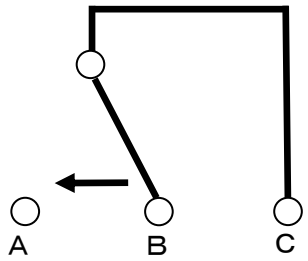
5-3 Wiring of the sensor

Connect the each sensor's line to terminal block according to the chart below.

Terminal	Wiring color
SENSOR (+)	White
SENSOR (−)	Black
SENSOR (TH+)	Red
SENSOR (TH−)	Green
SENSOR (GND)	Grey

5-4 Wiring of RELAY

A contact point of RELAY is that “C” is connected to “B” as usual (“A” is left open). If the measurement value exceeds the setting value, “C” is connected to “A” and “B” is left open.



* Rated load current is 5A at AC250V and DC30V.

The relation between RELAY port and each setting value

RELAY 1	Channel 1 ALARM H
RELAY 2	Channel 1 ALARM L
RELAY 3	Channel 2 ALARM H
RELAY 4	Channel 2 ALARM L

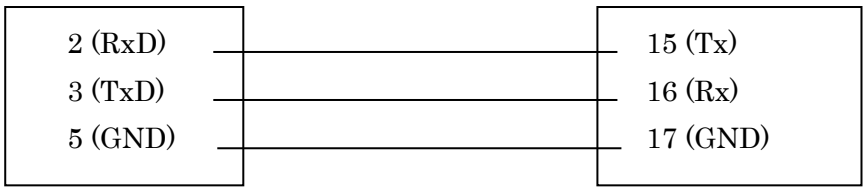
When the measurement value exceeds the setting value, “C” of “ALARM H” is connected to “A”.
When the measurement value falls below the setting value, “C” of “ALARM L” is connected to “A”.
(Usually, left open between “A” and “C”.)

5-5 RS-232C output

Data is output by using RS-232C interface.
Connect Tx terminal receiving data from the interface level meter to (16), Rx terminal to (15) and GND terminal to (17).

In the case of PC (PC/AT compatible machine), connect lines according to the chart below.

PC (PC／AT compatible machine) The body of the interface level meter
RS-232C output connector (9 pin)



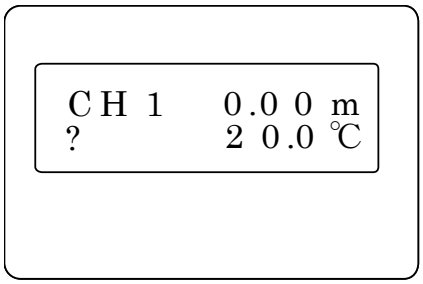
5-6 4-20mA output

4-20mA output has two systems, one is CH1 and the other is CH2.
At the CH1, + signal wire is connected to (30), － signal wire is connected to (31).
At the CH2, + signal wire is connected to (32), － signal wire is connected to (33).

6. Basic settings

6-1 SETTING MODE

After turned on the power, the display below is shown.



If pushed MENU key, the display moves to the display below of basic settings.

At SETTING MODE, set parameters. Up-down key of the cursor key is used to select a setting parameter, and left-right key of cursor key is used to set value to each setting parameter. After setting all parameters, push MENU key again to return to the measurement mode.

Moreover, if pushed CLR key, return to the state before coming into SETTING MODE.

```
SETTING MODE
 CHANNEL   : DUAL
 MODE      : A
 SCALE     : TOP
 CONTRAST  : 10
 4－20 fix : hold
CH1
 SENSOR    : 0.0m
 DEPTH     :10.0m
 RESPONSE  : 1000m/min
 ALARM H   : 0.0m
 ALARM L   : 0.0m
 OUT  4mA  : 0.0m
 OUT 20mA  : 0.0m
```

The details of each parameter are as follows.

CHANNEL : Switch measuring mode
- CH1 (Measurement by CH 1 only)
- CH2 (Measurement by CH 2 only)
- DUAL (Simultaneous measurement by CH1 and CH2)

MODE : Display mode (MODE A, B and C).

SCALE : Selection of the basic measurement point (TOP and BOTTOM). Set BOTTOM as usual.

CONTRAST : Contrast adjustment of LCD.

4－20 fix : 4-20mA output setting in case that measurement error happens. (hold, 4mA and 20mA).

CH : Selection of the set channel.

Each setting of CH1 and CH2 is needed from SENSOR through OUT 20mA.

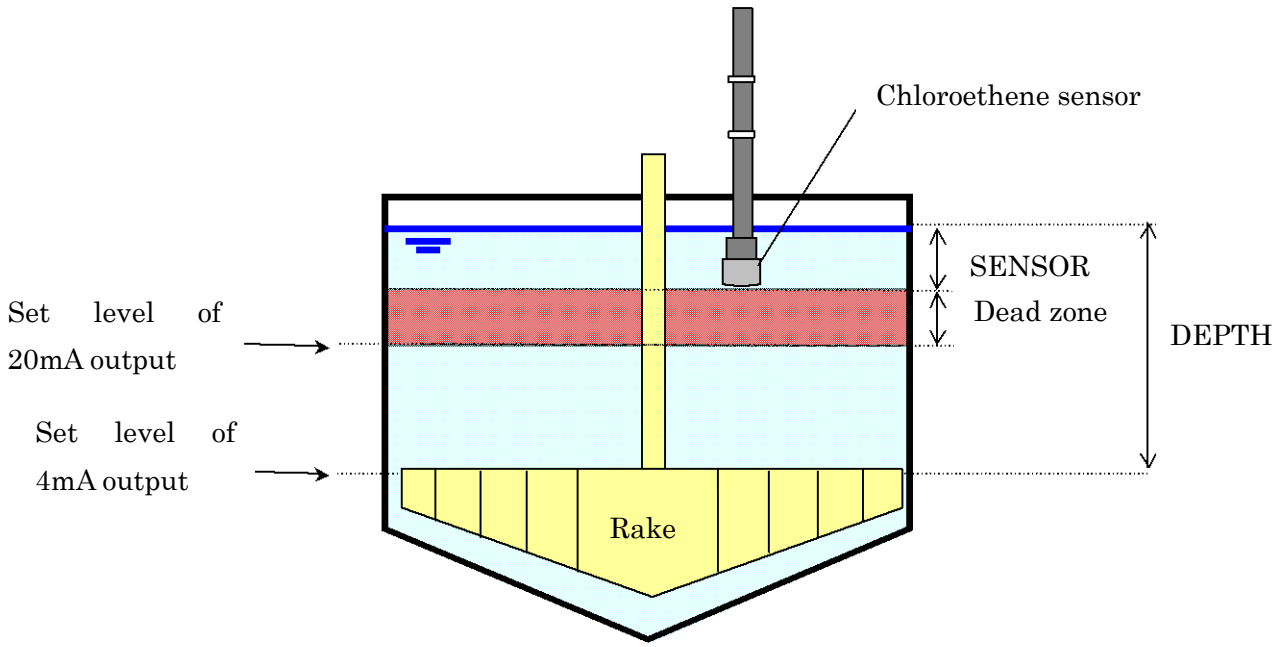
Make a choice to set parameters between CH1 and CH2.

ＳＥＮＳＯＲ	:	Distance from the surface of water to the surface of the sensor.
ＤＥＰＴＨ	:	Distance from the surface of water to the bottom of bath.
ＲＥＳＰＯＮＳＥ	:	Limitation of moving range of the measurement value for 1 min. Setting value: 0.01, 0.10, 1, 10, 100, 1000 (m/min.) If the setting value gets smaller, the moving range gets smaller. (The response gets slower.) To prevent the effect of reflected echo from floating sludge from measuring the interface level, set RESPONSE smaller.
ＡＬＡＲＭ　Ｈ	:	High alarm (If the measurement value exceeds the setting value, “C” is connected to “A”.)
ＡＬＡＲＭ　Ｌ	:	Low alarm (If the measurement value fall the setting value, “C” is connected to “A”.)

*Please refer to “5-4. Wiring of RELAY” on page 8 about “ALARM H” and “ALARM L”.

ＯＵＴ　４ｍＡ	:	Setting level of 4mA output.
ＯＵＴ　２０ｍＡ	:	Setting level of 20mA output.

Ex) In case that BOTTOM is set to SCALE,



The distance within 0.4m from the surface of the sensor is dead zone; HL2000 can’t measure this range at all.

7．Display mode

Display mode has 3 types. And following instruction is explained about the each mode.

① Mode A; Numeric display of the interface level(s)

② Mode B; Trend display of the interface level

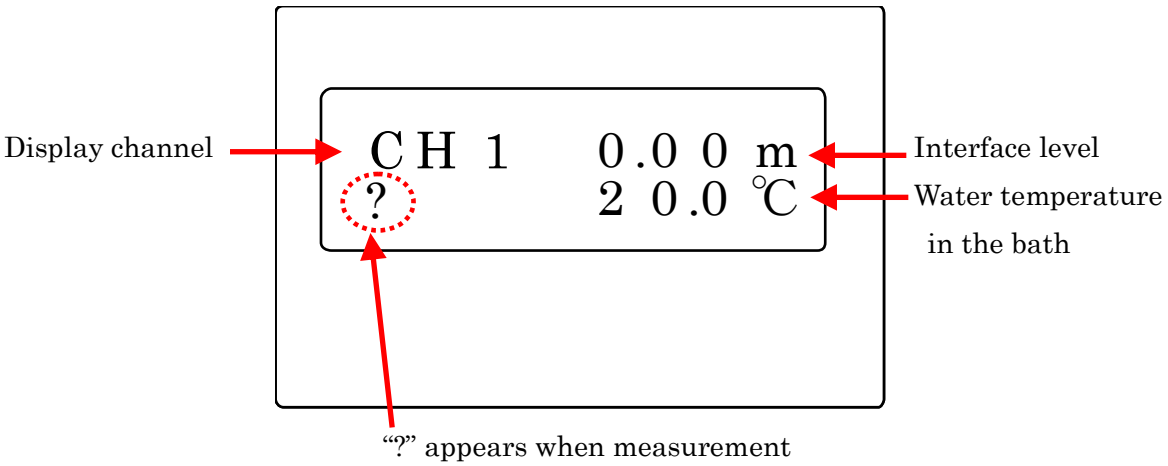
③ Mode C; The display of the ultrasonic reflection wave

7 - 1 Mode A; Numeric display of the interface level

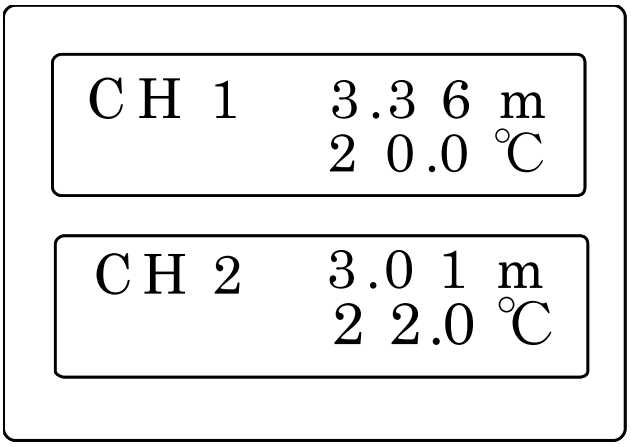
The interface levels of CH1 and CH2 are displayed by numeric value.

In the case that the measurement error happens, "？" appears under CH 1 and CH 2.

Single display mode

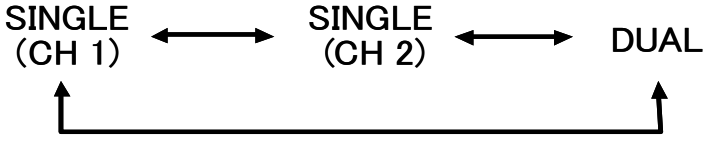


DUAL display mode

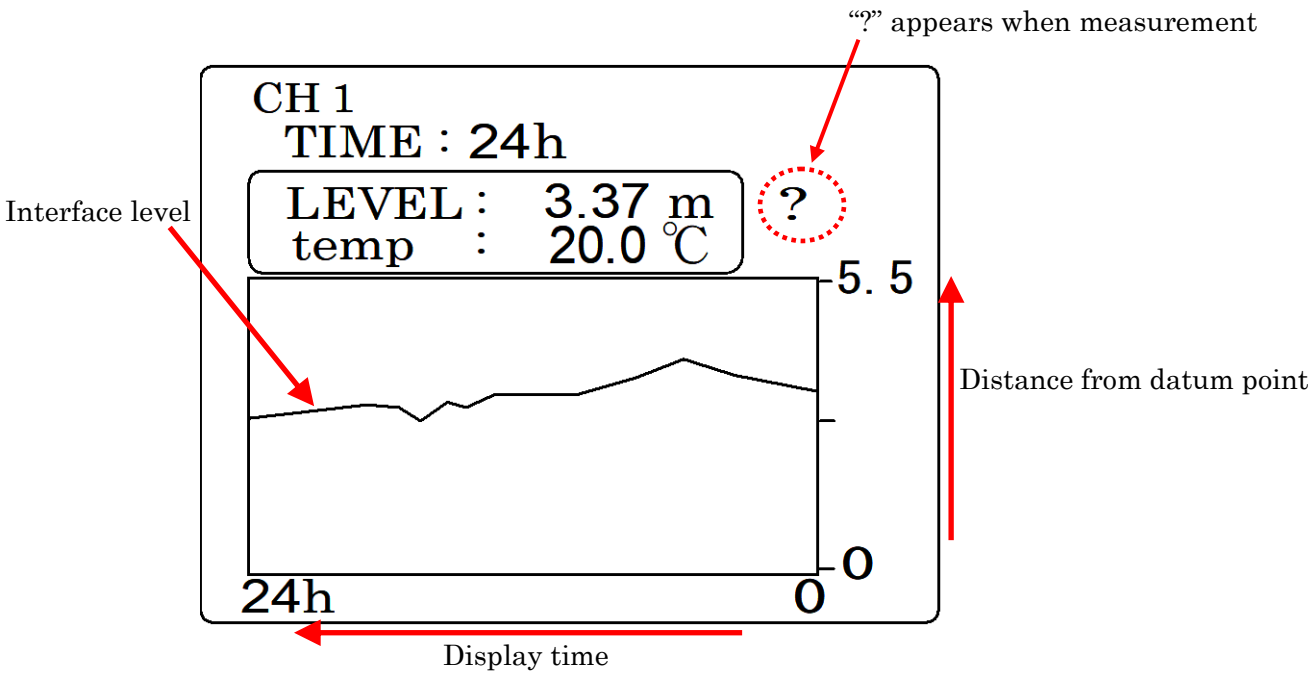


Display channel is switched like the chart below by left-right key.

(Available when used DUAL measurement only)



7 - 2 Mode B; Trend display of the interface level (In case BOTTM is set to SCALE)



Time change of the interface level is displayed by trend graph.

ＣＨ : Setting of display channel

ＴＩＭＥ : Setting of display time

(5 min., 10 min., 30min., 1 hour, 2 hours, 3 hours, 6 hours, 12 hours, 24 hours, 48 hours)

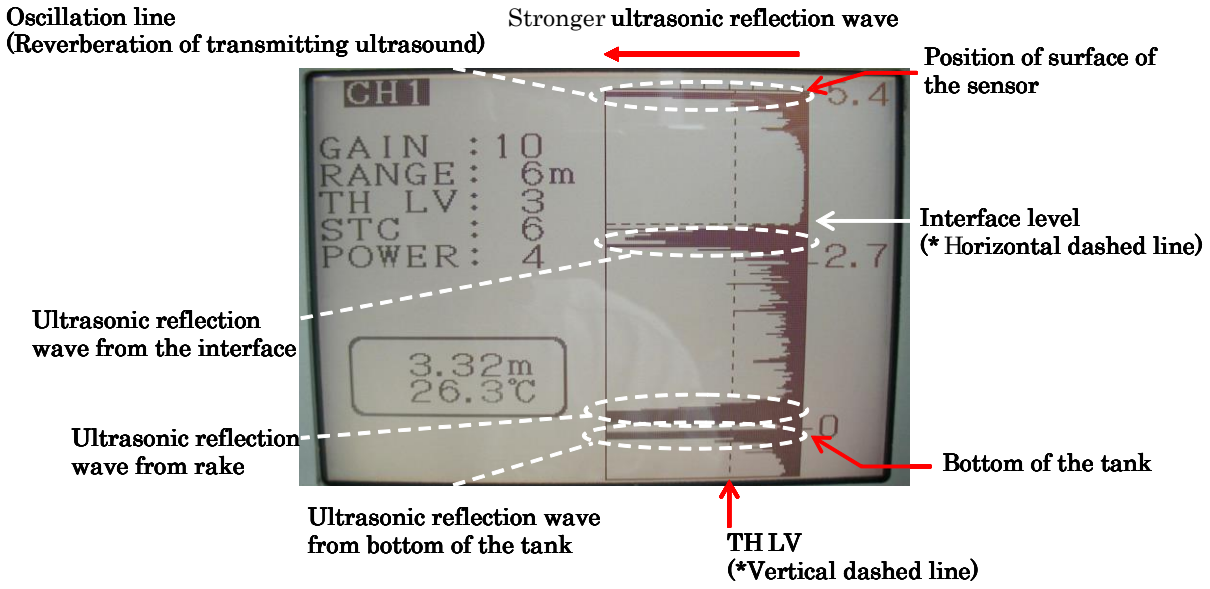
To change display channel and display time, select a parameter by up-down key of cursor and change the value of the parameter by left-right key of cursor.

ＬＥＶＥＬ : The current interface level is displayed by m(meter).

ｔｅｍｐ: The current water temperature is displayed.

In the case that the measurement error happens, "？" appears on the right side of the box displayed the water temperature.

7-3 Mode C; Waveform display of the ultrasonic reflection waves



The ultrasonic reflection wave is displayed by graph.

Set values to parameters for judgment of the interface level at this mode.

The distance within 0.4m from the surface of the sensor is dead zone; HL2000 can't measure this range at all.

Ask the expert in HL2000 to set the parameters for judgment of the interface level.

See the chart below about the setting parameters at this mode.

ＣＨ : Setting of display channel.

ＧＡＩＮ : Setting of receiver's sensitivity.(0～10)
If bigger value is set to GAIN, the sensitivity gets higher.

ＲＡＮＧＥ : Setting of display range of reflection wave form.(1～10m)
As usual, set the depth of tank to RANGE.

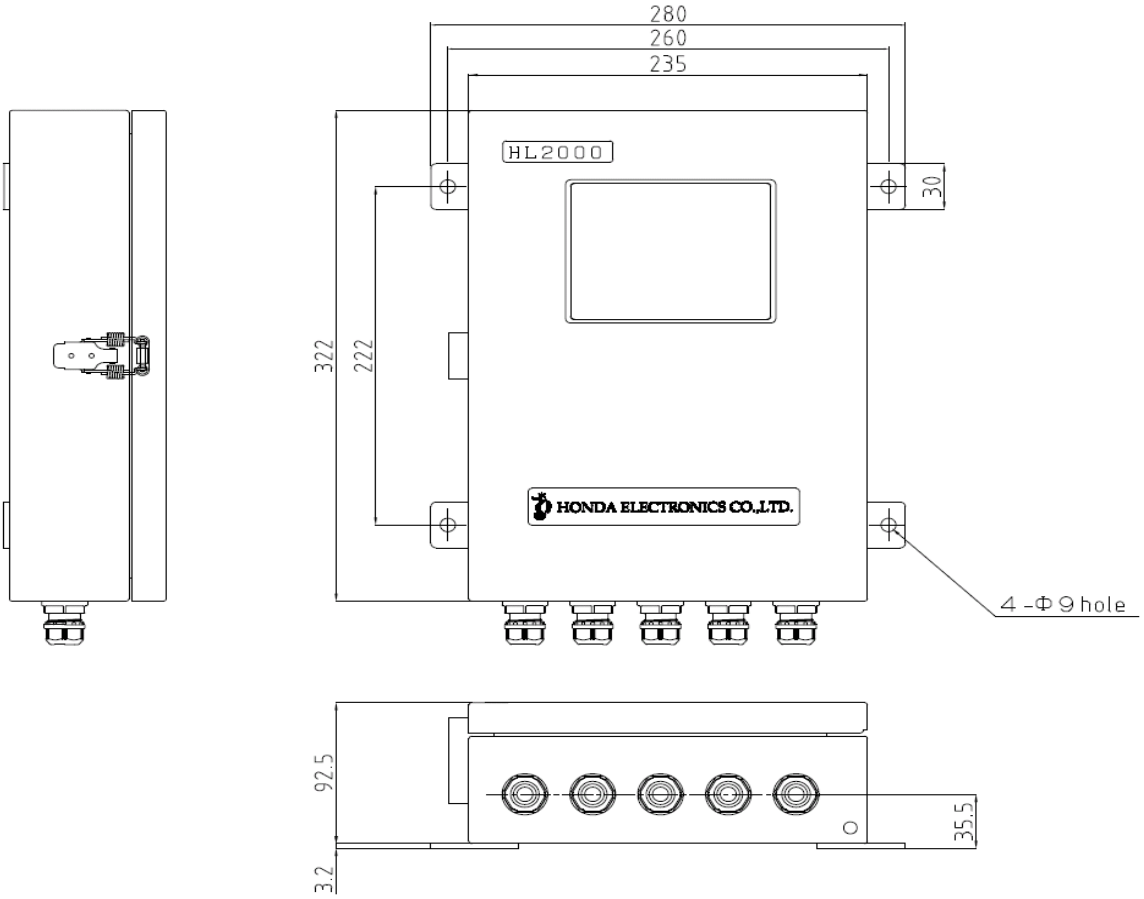
ＴＨ　ＬＶ : TH LV means Threshold Level. Threshold level of reflection intensity for judgment of the interface is set. (0～9,PK)　In the chart above, the vertical dashed line means TH LV value. Set TH LV value as the ultrasonic reflection wave from the interface can always exceed TH LV. However, if PK is set to TH LV, the vertical dashed line doesn't appear and the position of the ultrasonic reflection wave which exceeds the box of waveform display is recognized as the interface level.

ＳＴＣ : Adjust sensitivity near the surface of the sensor.(0～7)　However, if the value of STC gets bigger, sensitivity near the surface of the sensor gets lower. STC is a function to make the ultrasonic reflection wave of suspended solids which are acted as a drag smaller. Pay attention when set the value to STC because the ultrasonic reflection wave from the interface is also come under the influence of STC.

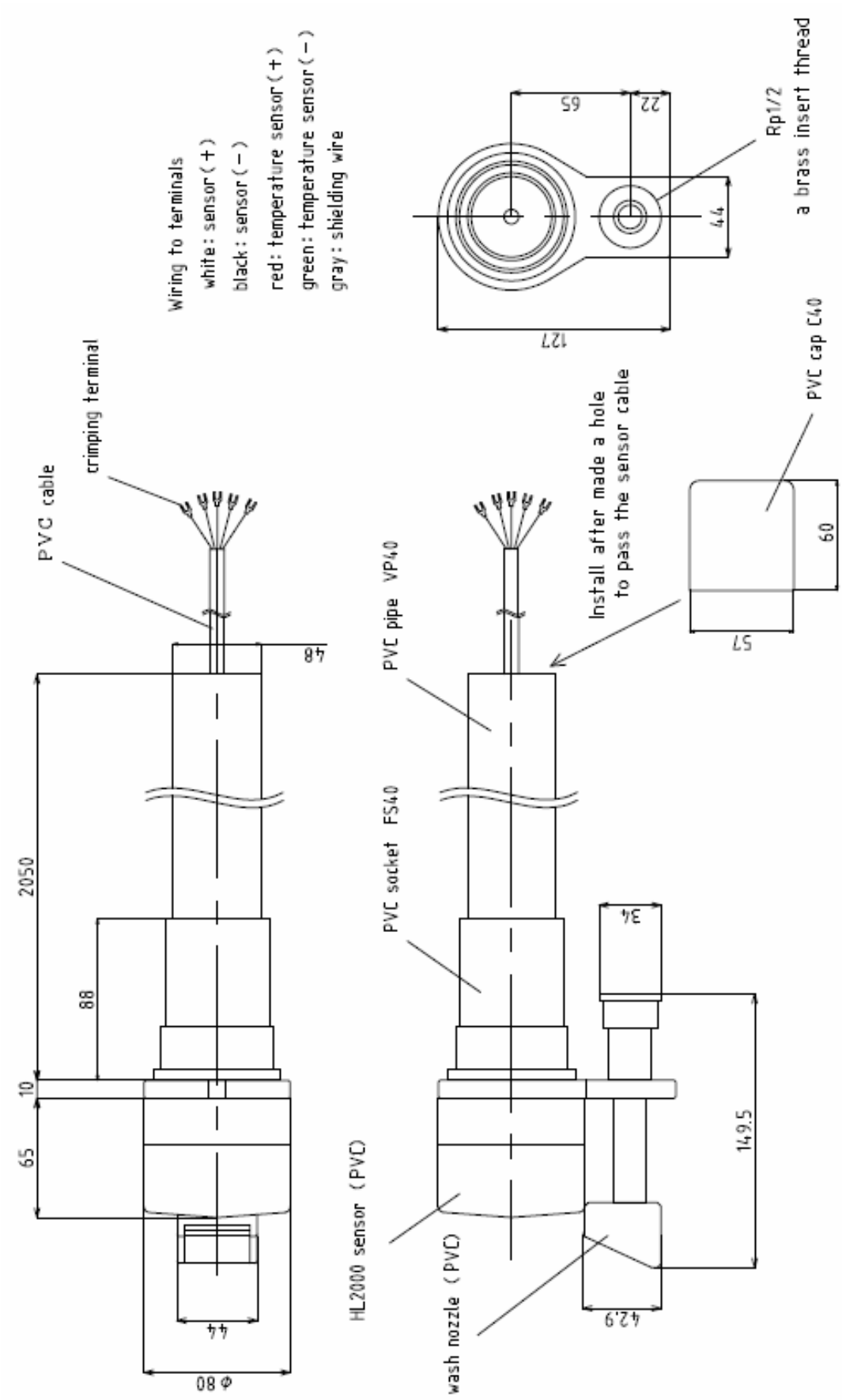
ＰＯＷＥＲ : Adjusting the power of transmitting ultrasonic wave.(1～4)　If POWER value gets bigger, the power gets bigger.

8. Outside dimensions

8－1 HL2000 controller



8 － 2 HL2000 sensor (with the wash nozzle and Mounting pipe)



９．Specification

Specification of HL2000 controller

Model		HL2000
Measurement system		Ultrasonic pulse reflective system
Number of measurement channels		2 channels
Frequency		400kHz
Measurement object		Sludge interface
Measurement range		0.4～10m
Resolution		1cm
Data updating cycle		1 sec.
Power supply		AC85～264V　10VA
Connection method		Terminal connection
Display		LCD (Monochrome) ・ Mode A; Numeric display of the interface level(s) ・ Mode B; Trend display of the interface level ・ Mode C; The display of the ultrasonic reflection wave
Output	Relay output	Upper and lower limit relay output on 2 channel each (4 lines in total)
	4-20mA current output	16 bit on 1 channel each
Interface		RS-232C
Use conditions		Temperature: -10～60 deg. C Humidity: 0～85% RH
Material		Painted steel
Protection standard		IP54
Outside Dimensions		280(W) x 322 (H) x 92.5(D)
Weight		3.6kg

Specification of HL2000 sensor

Frequency	400kHz
Sensor directivity angle (Full size)	6° (full size)
Use conditions	Temperature: -5～60 deg. C
Material	Case: PVC Cable: PVC
Cable Dimensions	φ6.7mm×20m(Standard)
Protection standard	IP68

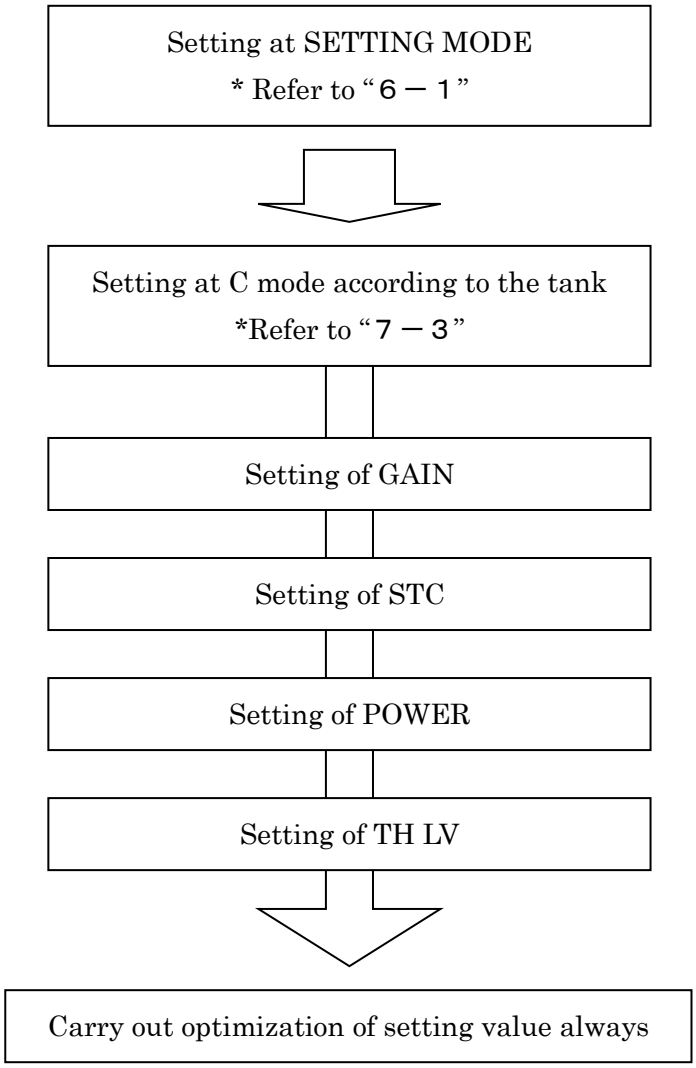
１０．Setup

Article	Quantity
HL2000 Controller	1 (2CH specification)
HL2000 sensor	1 (or 2*)
Wash nozzle	1*
Mounting pipe	1*
Operation manual	1
Warranty certificate	1

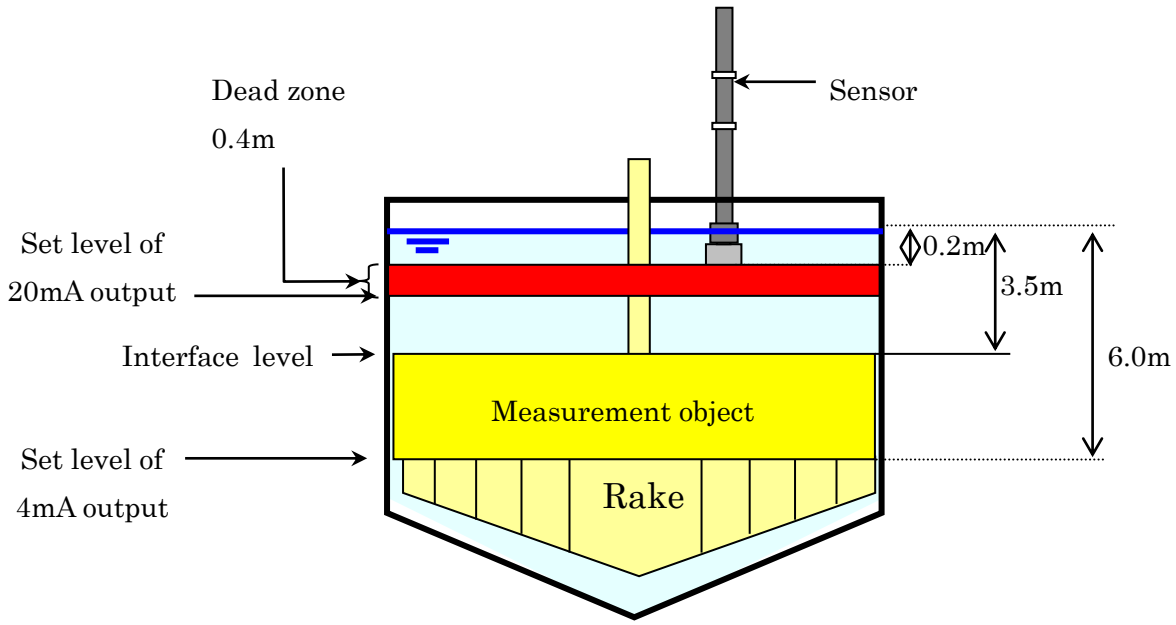
*Option

１１．Example of initial settings

Procedure initial settings as follows;



Ex) In case of the following settled tank



* Set level of 20mA output is recommended that the value is subtracted the dead zone, under 40cm from the surface of the sensor, from DEPTH because the actual measurement range is under the dead zone.
* The depth of the tank is identified as the distance from the surface of liquid to the rake

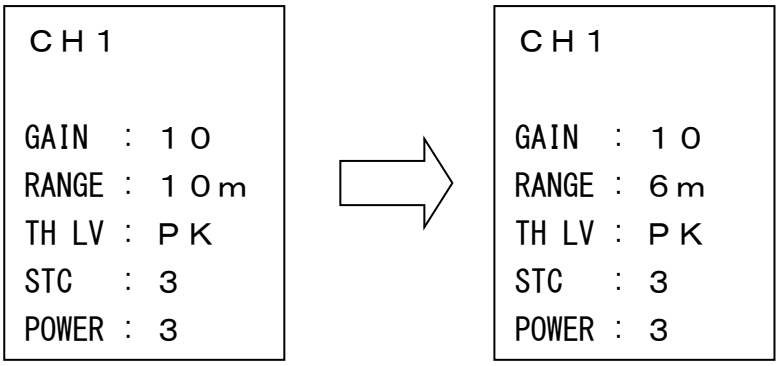
At SETTING MODE, set the values as follows.

```
SETTING  MODE
 CHANNEL    :  1
 MODE       :  C
 SCALE      :  BOTTOM
 CONTRAST   :  10
 4-20 fix   :  hold
CH1
 SENSOR     :  0.2m
 DEPTH      :  6.0m
 RESPONSE   :  1000m/min
 ALARM H    :  0.0m
 ALARM L    :  0.0m
 OUT  4mA   :  0.0m
 OUT 20mA   :  5.4m
```

Push SET button. (Continued to next page)

Next, set the values at C mode.

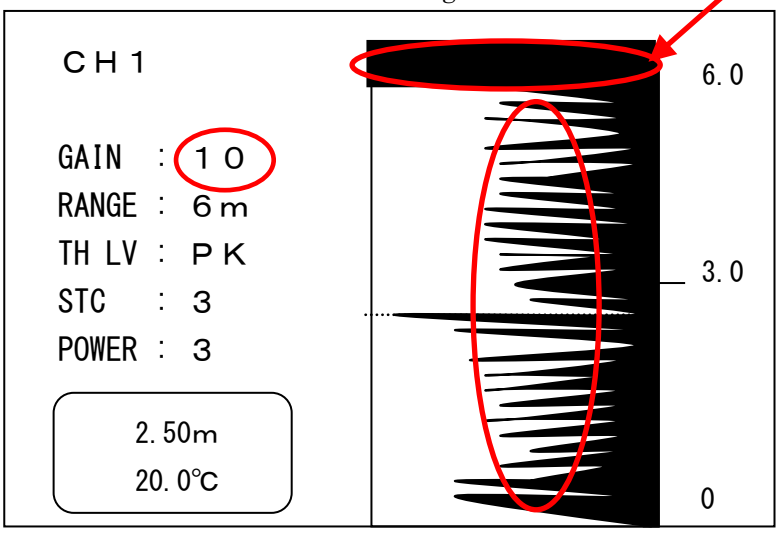
The initial setting is the following chart on the left, then change the initial setting to the following chart on the right.



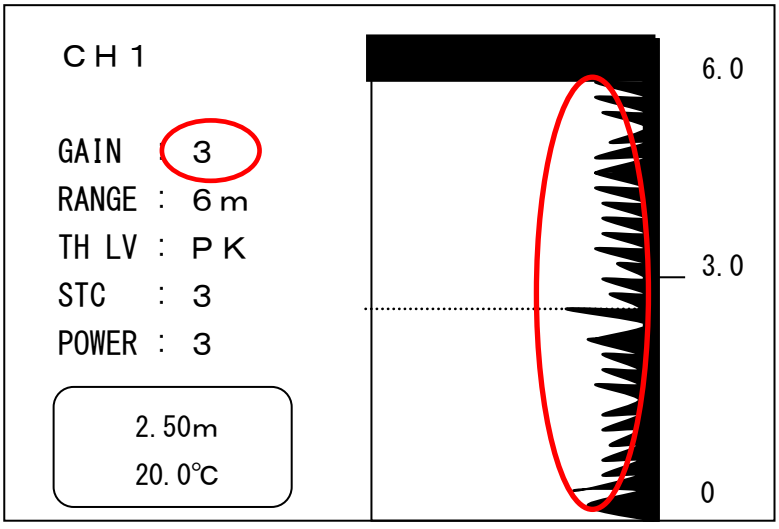
１１-１ Setting GAIN value

Oscillation line (Not effect to measuring interface level)

The ultrasonic reflection wave： Stronger ← Weaker

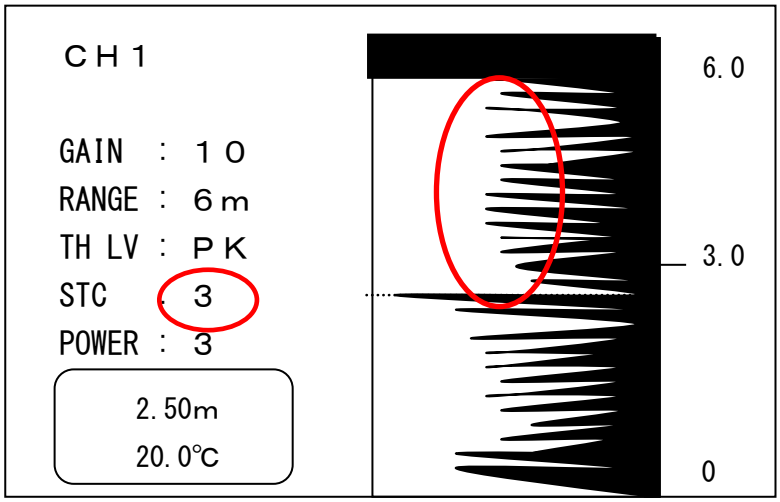


In case that GAIN value gets smaller,

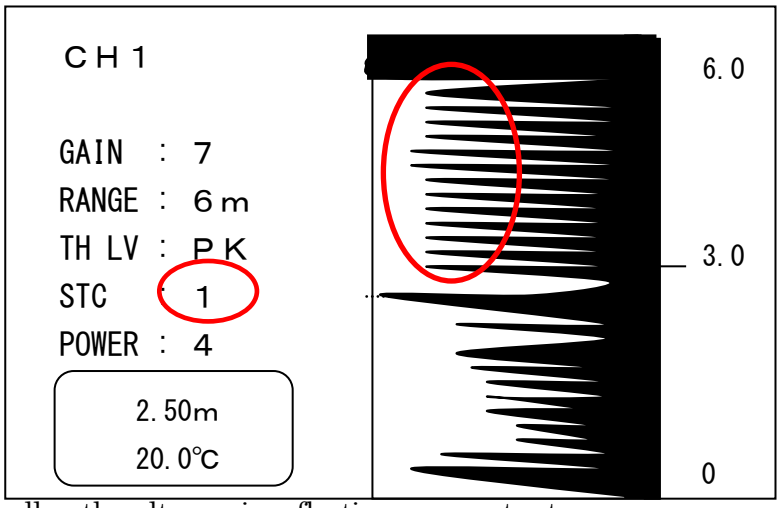


If GAIN value gets smaller, the ultrasonic reflection wave gets weaker.

１１-２ Setting STC value

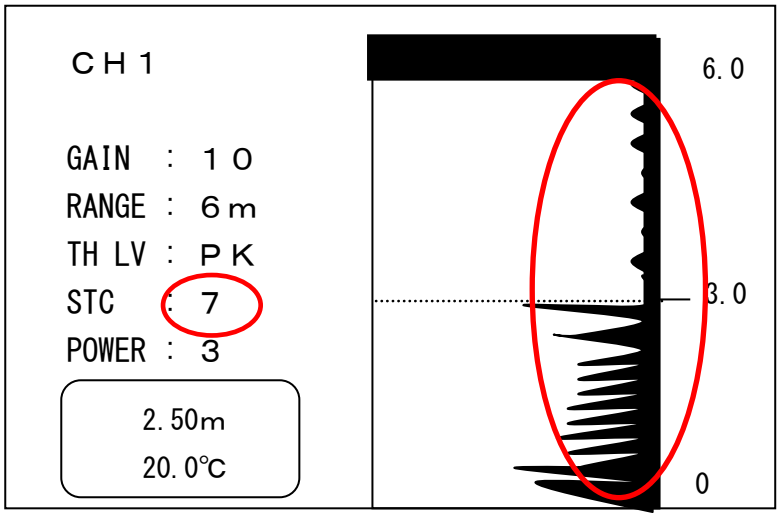


In case that STC value gets smaller,



If STC value gets smaller, the ultrasonic reflection wave gets stronger.

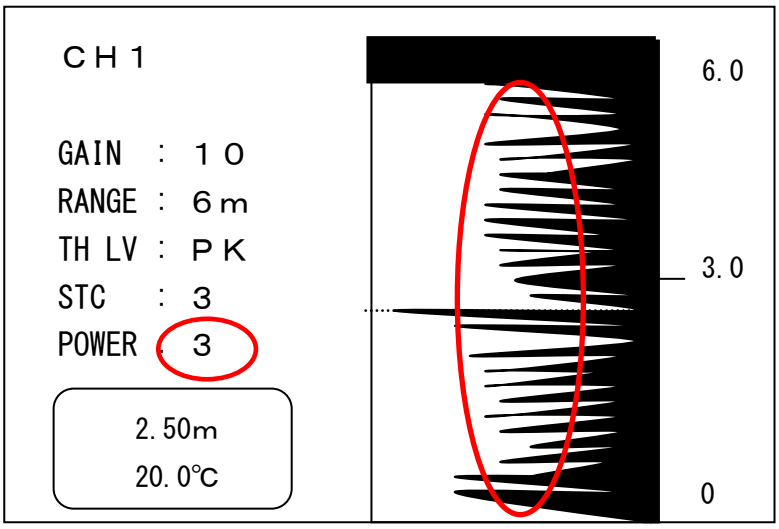
In case that STC value gets bigger,



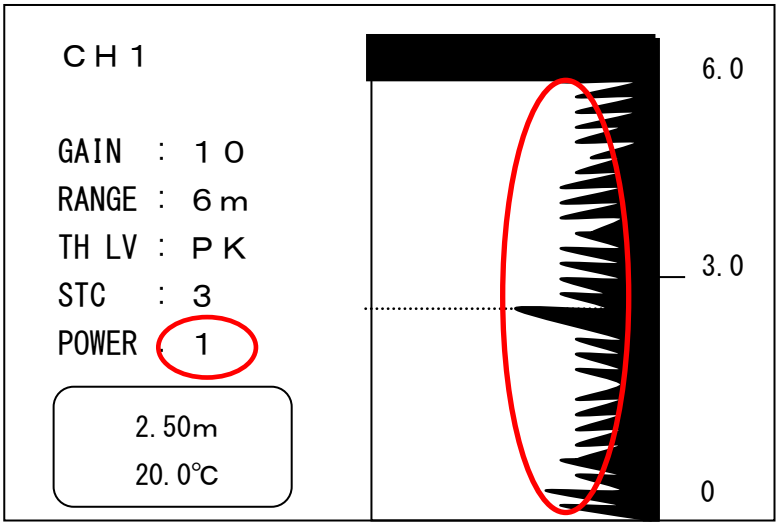
If STC value gets bigger more than necessary, the sensitivity of upper part of the ultrasonic reflection wave is reduced like the chart above, moreover, the whole sensitivity is also affected and reduced by STC value.

Take extra care when setting STC value.

１１-３ Setting POWER value



In case that POWER value gets smaller,



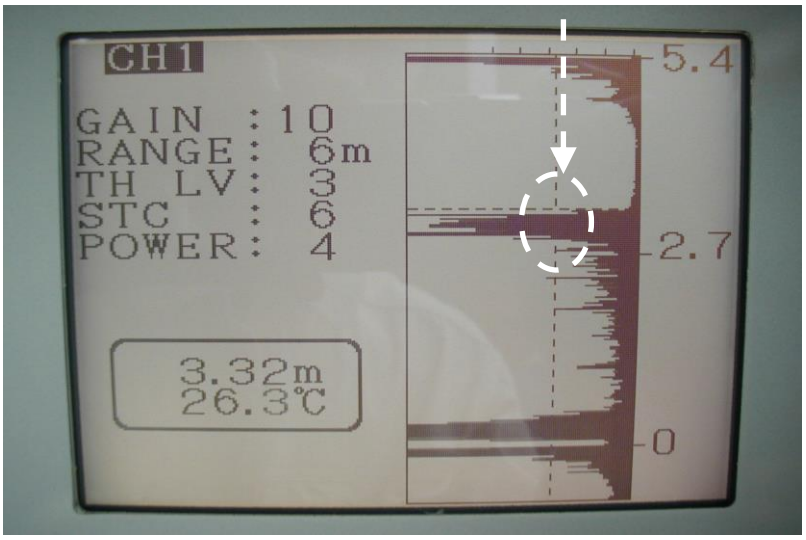
If POWER value gets smaller, the whole ultrasonic reflection wave gets weaker.

Set optimum values of GAIN, STC and POWER to distinguish between the ultrasonic reflection wave from the interface and the reflected echo from others. And set TH LV value as the ultrasonic reflection wave from the interface can always exceeds TH LV under the condition that the interface can be discerned.

However, adjustment of setting is always needed according to the condition of the interface, so optimize the settings on a case by case basis.

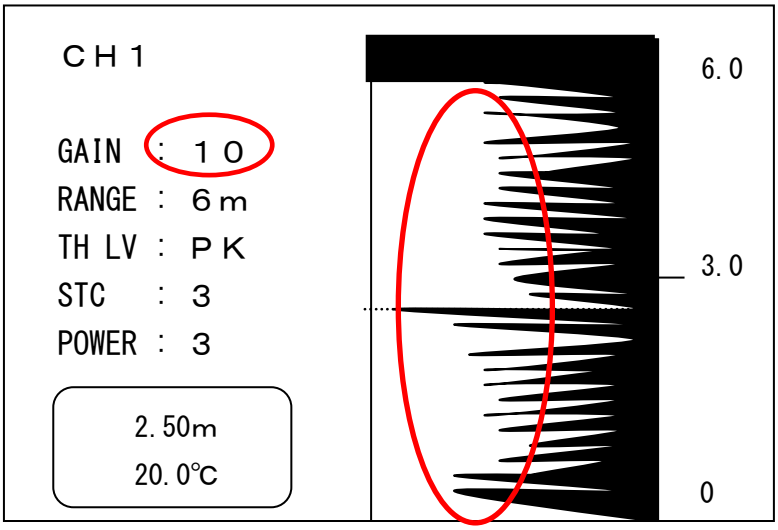
HL2000 completed adjustment judges the shallowest ultrasonic reflection wave which exceeds TH LV except dead zone (under 40cm from the surface of the sensor) as the interface.

*Set TH LV value that can be exceeded by the ultrasonic reflection wave which is regarded as the interface and

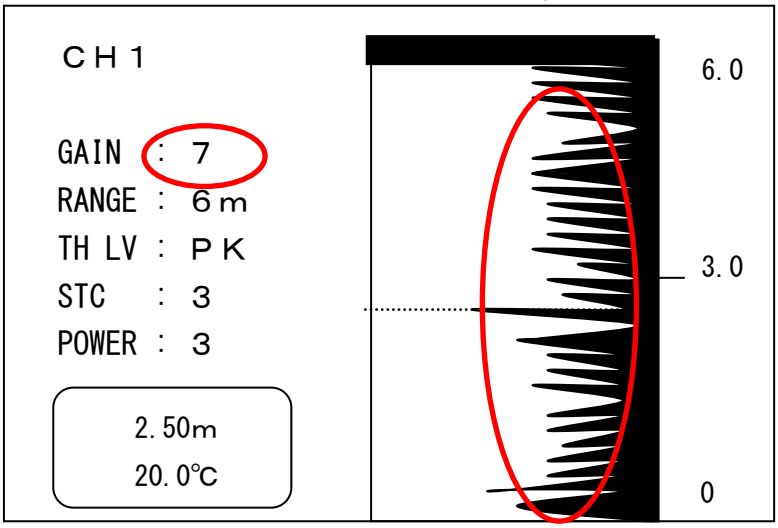


*Ask the expert in the product to set values. And if you have any questions, please contact the manufacturer or the dealer.

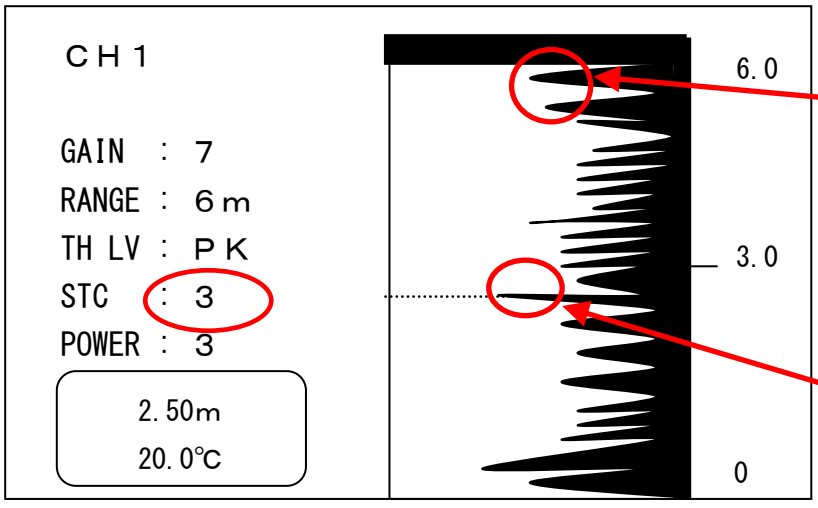
１２．Standard settings



Set GAIN value to smaller value because the sensitivity is too high in the chart above.



Next, in the chart below, there is a fear that it is impossible to distinguish the ultrasonic reflection wave from the interface as being different from others because the ultrasonic reflection waves from the upper part is too strong except the oscillation line. Therefore, set STC value to smaller value.



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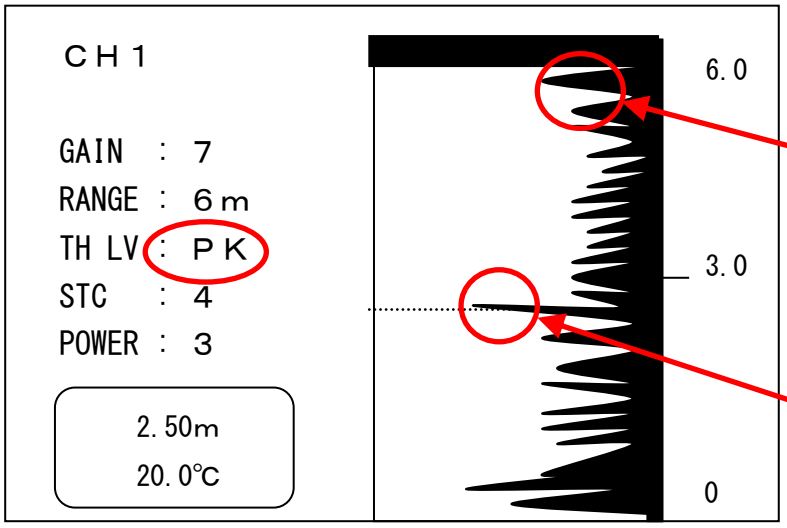
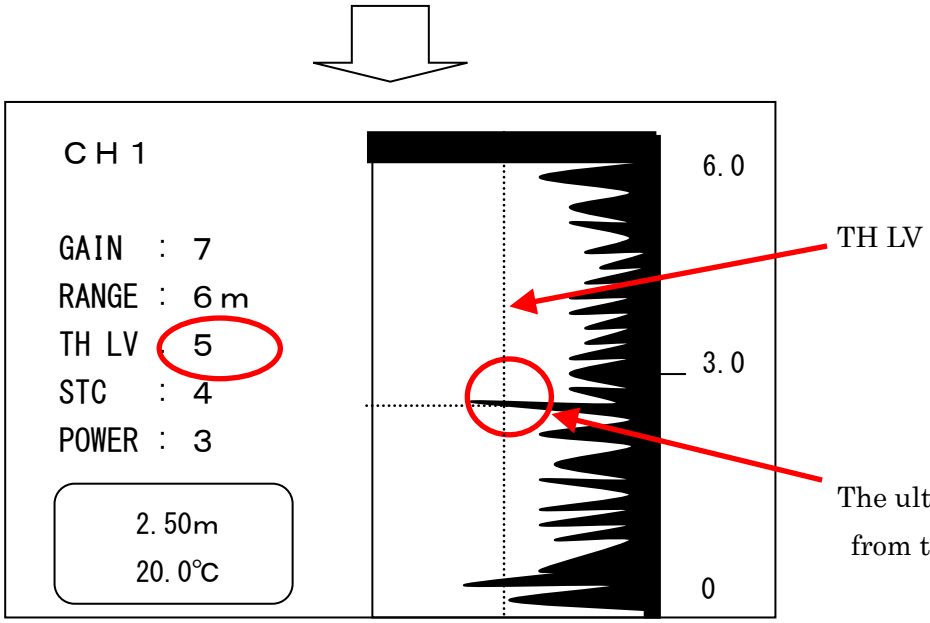
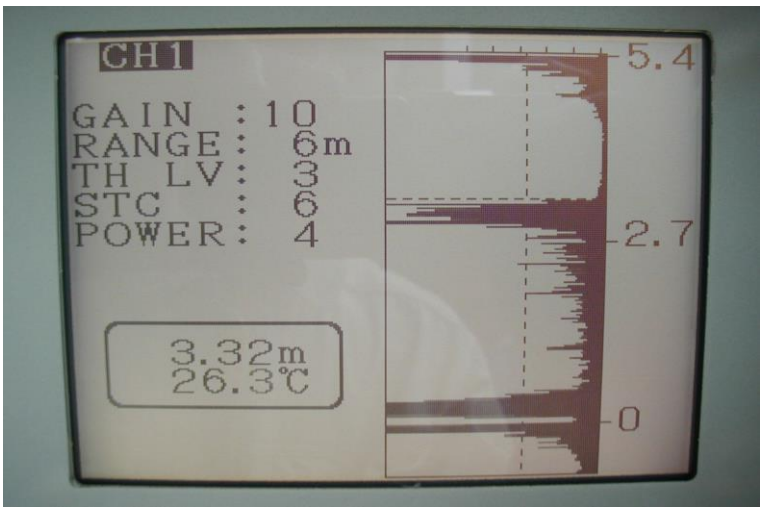


And then, set TH LV value as the ultrasonic reflection wave from the interface can always exceeds TH LV.



Optimize the settings to display the ultrasonic reflection waves like the chart below.

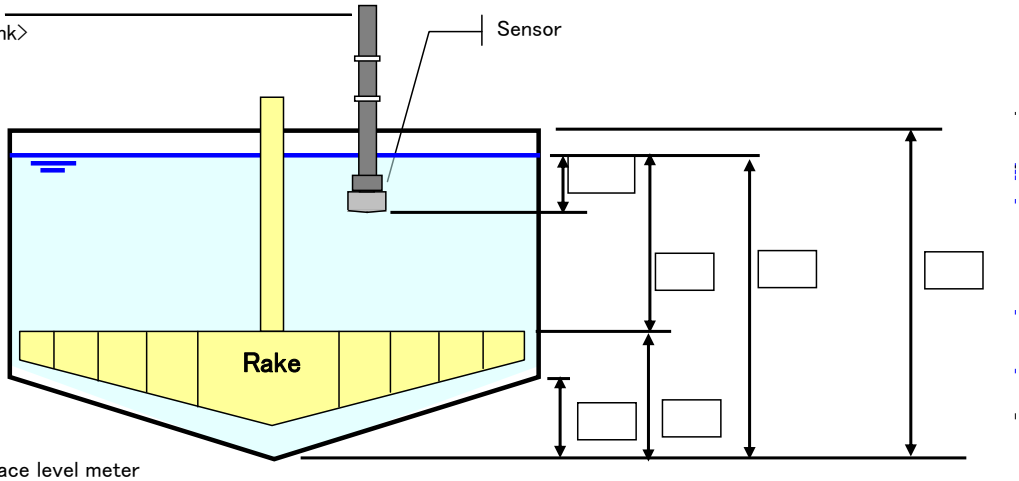


１３．For reference (Setting Report)

Setting Report of HL2000 (Interface level meter)

Date
Client
Place
Type of tank
Measurement object
Model HL2000

<Outline of the settled tank>



Setting contents of Interface level meter
Basic settings
(CH1)

Parameter	Setting value	Remarks column
SCALE		
CONTRAST		
4-20		
SENSOR		
DEPTH		
RESPONSE		
ALARM(H)		
ALARM(L)		
OUT 4mA		
OUT 20mA		

Settings for interface measurement at MODE C

Parameter	Setting value	Remarks column
GAIN		
RANGE		
TH LV		
STC		
POWER		

Remarks

Prohibited duplicate

HL2000 V1.2

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○This operation manual printed in April , 2010.

○ For improvement of the product, the specifications are subject to change without notice. Please be forewarned.