Operation Manual

for Near-Distance Ultrasonic Level Meters Version 3. 10 or later

HD500-C2 (200 kHz)
HD500-D2 (400 kHz)

Contents

Carefully read this Operation Manual before using the instrument.
Store this Operation Manual in a readily accessible location.

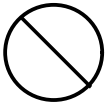
HONDA ELECTRONICS CO.,LTD.

Safety Precautions

This manual uses the following signs and symbols to promote safety and correct use of the product, and to prevent injury and property damage.

WARNING	Indicates a potentially hazardous situation that, if ignored or incorrectly handled, could result in death or serious injury.
CAUTION	Indicates a potentially hazardous situation that, if ignored or incorrectly handled, could result in injury or property damage.

Examples of indications

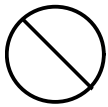
	This symbol indicates “what should not be done.”
	This symbol indicates “what should be done.”

The following information must be observed to ensure instrument safety.

WARNING

	If there are any abnormalities, such as fumes or unpleasant odors, turn off the power immediately, confirm that no fumes are being emitted, and contact your distributor for repairs.

CAUTION



Do not modify the instrument. Otherwise, electric shock may occur due to the high voltages involved. In the event of instrument failure, contact your distributor for repairs.

Other Precautions

- Do not use the instrument near another device that uses ultrasonic waves. The instruments may interfere with each other, resulting in malfunctions.
- Do not expose the instrument to strong shocks or impacts.

Preface

Thank you for purchasing the HD500 near-distance ultrasonic level meter.

- This Operation Manual presents instructions on the proper use of the product. Read this manual carefully before using the product. Please note that Honda Electronics assumes no liability for damages or loss of profits suffered by any user or third party resulting from the user's improper handling and/or use of the product.
- Store this manual in a readily accessible location and refer to it as necessary.
- The information contained in the manual is subject to change without notice.
- Every effort has been made to ensure the accuracy of the information herein. If you have any questions or comments regarding a possible error or any other issue, please contact us.
- This document may not be copied or reproduced in whole or in part. No part of this manual may be reproduced or transmitted in any form without the express written consent of Honda Electronics.
- Honda Electronics hereby disclaims any and all liability for damages incurred by any party resulting from measurements obtained using this instrument.

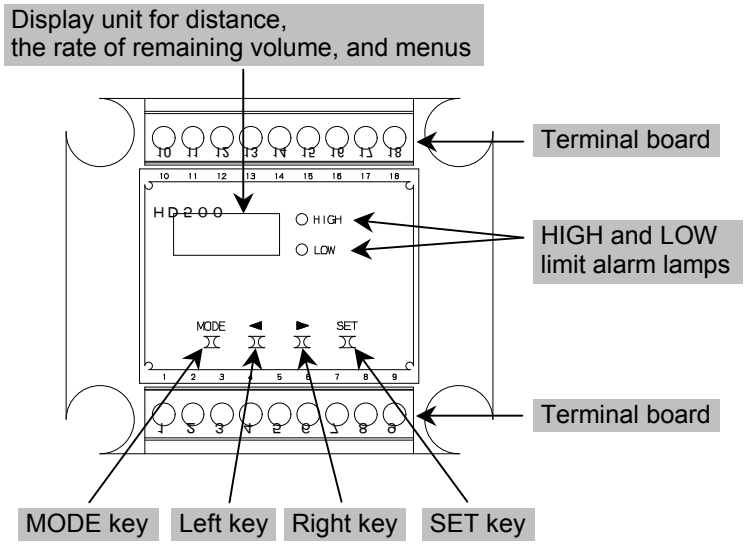
Checking the Accessories

After receiving the product, make sure that the following accessories are contained in the package. Contact your distributor regarding any missing part.

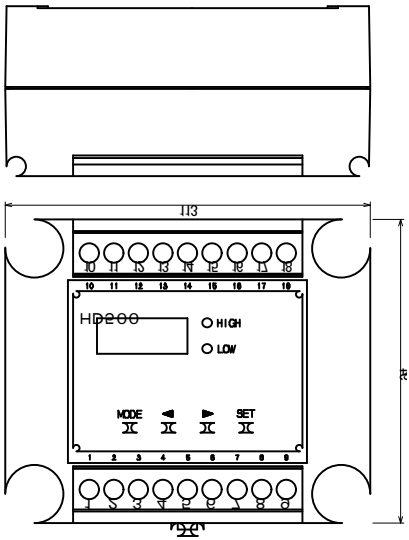
Moreover, check the information included in the Warranty Card and be sure to keep the card in a safe place.

- **HD500 (instrument) 1**
- **Instrument-mounting metal (provided with the instrument) ...1**
- **Ultrasonic sensor 1**
- **Operation Manual 1**
- **Warranty Card 1**

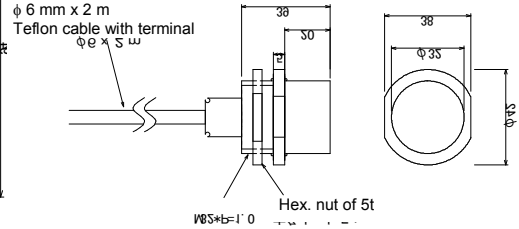
Names of Parts



Dimensions



Control unit

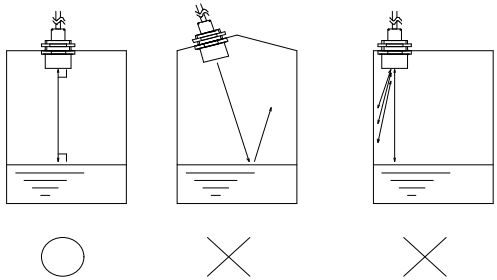


Ultrasonic sensor

Installation Method and Directions

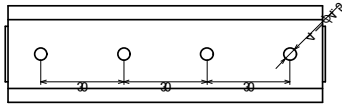
Installing the sensor

- Install the HD500 ultrasonic sensor horizontally on top of a tank.
- Make a hole with a diameter of ϕ 32 mm and a thickness of 10 mm or less on the tank.

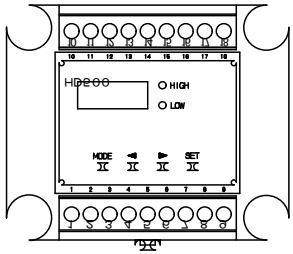


- Install the sensor so that the ultrasonic wave transmitting/receiving surface is parallel with the surface of the liquid.
- If the ultrasonic wave transmitting/receiving surface is close to the sidewall, the sensor may detect unnecessary reflected ultrasonic waves, resulting in erroneous measurements.
- For screw-in installation, screw in the sensor with a wrench. Be careful not to over-tighten the screw.
- Do not install the sensor in locations exposed to direct sunlight.
- Do not install multiple sensors on the same tank.
  (Ultrasonic waves may interfere with each other, resulting in erroneous measurements.)

Installing the instrument

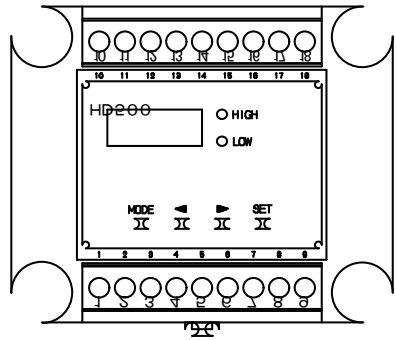


Instrument-mounting metal



↓ Clamp

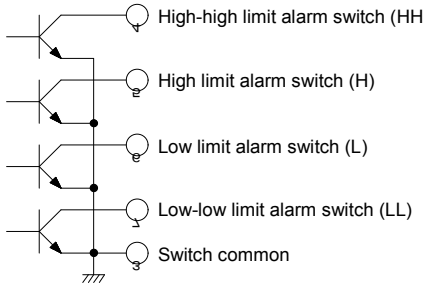
- Install the instrument-mounting metal (ϕ 4.5-mm holes).
- Hook the instrument over the mounting metal and pull down the clamp to secure the instrument.



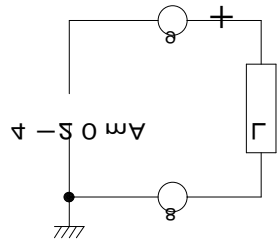
Description of the Terminals

1: Power input (0 V)	10: RS232C — Receive
2: Power input (+12 ~ 24 V)	11: RS232C — Transmit
3: Alarm switch common, F.G.	12: RS232C — GND
4: High-high limit alarm switch (HH)	13: N. C.
5: High limit alarm switch (H)	14: Sensor (red) TS
6: Low limit alarm switch (L)	15: Sensor (green) GND
7: Low-low limit alarm switch (LL)	16: Sensor (black) TD-
8: 4–20 mA (GND)	17: Sensor (gray) Shield
9: 4–20 mA (output)	18: Sensor (white) TD+

High-high, high, low, and low-low limit alarm switches (transistor outputs)



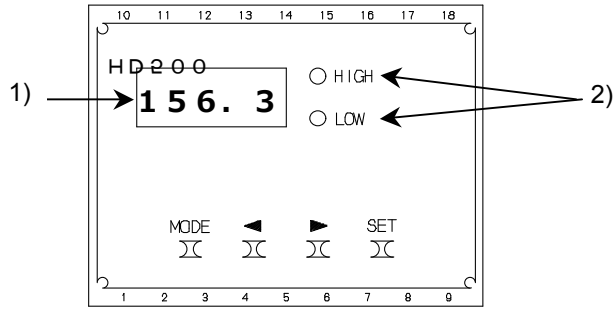
4–20 mA current output



[Caution]

- The rating of high-high, high, low, and low-low limit alarm outputs is 30 V DC , 100mA or less.
- 4–20 mA Allowable load resistance 500 Ω or less
  Resolution 65536 (16 bits)

Description of Display



Reading the display:

1) Generally, the display unit indicates the distance or rate of the remaining volume (e.g., 156.3 mm). This indication can be switched in menu –5–.

2) The alarm lamps and switches function according to the settings of the high-high, high, low, and low-low alarm switches, in the event of an alarm.
These alarm switches can be set using menus –0– and –1–.

[Caution]

The display unit shows "– – – –" to indicate a measurement error when:

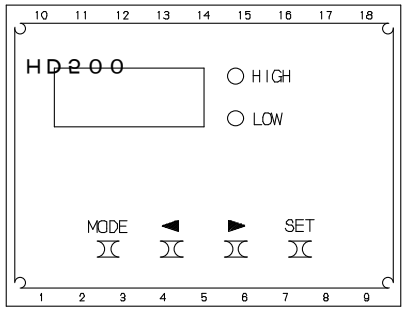
- No reflected ultrasonic wave is detected.
- The measured distance varies due to the presence of noise.
- The target distance has exceeded the measurement range.

C	1000 mm or more	D	450 mm or more

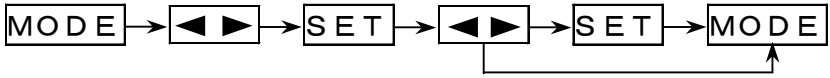
[Caution]

The display unit shows the program version and type immediately after the instrument is turned on.

Example: C3.XX C = 200 kHz
d3.XX D = 400 kHz



When using a menu, press the MODE key, select a menu number using the ◀ and ▶ keys, press the SET key, and change each setting using the ◀ and ▶ keys. After completing setting, press the MODE key to exit menu setting.



- The menu numbers are indicated in the form of –X–.
  The –X– represents a number from 0 to 27.
- The information of menu settings will be backed up by EEPROM, which will preserve the settings even after the instrument is turned OFF.

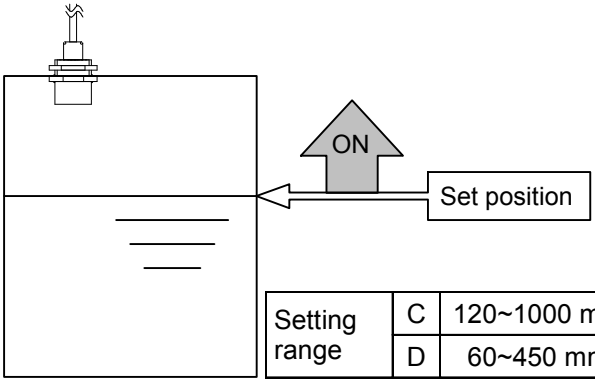
[Caution]

Pressing the MODE key to put the instrument into menu mode will cause both the HIGH and LOW LEDs to light up simultaneously.

During menu selection: Red, Red

During modification of a set value: Green, Green

–0–A Setting the high-high limit alarm switch (HH)

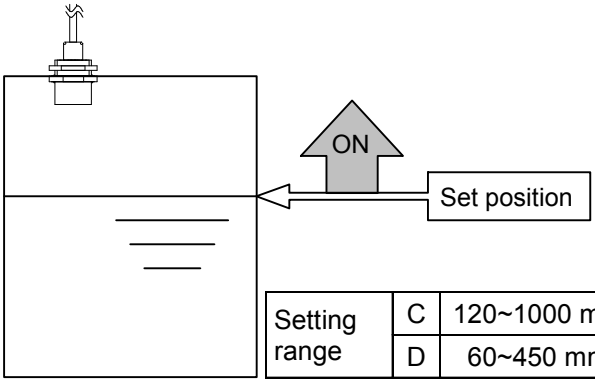


Setting range	C	120~1000 mm	4.7 in~3 ft 3.3 in
	D	60~450 mm	2.3 in~1 ft 5.7 in

If the liquid level exceeds the high-high limit set position, the high-high limit alarm switch is activated, lighting up the HIGH lamp (in red) simultaneously. Set the position in terms of the distance from the ultrasonic wave transmitting/receiving surface of the HD500.

(It can be set in units of 1 mm or 0.1 inch.)

–0–b Setting the high-limit alarm switch (H)

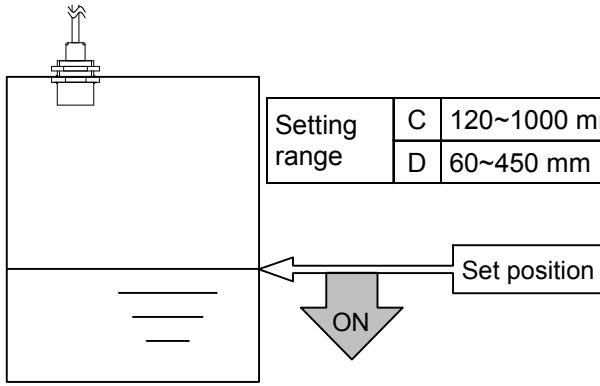


Setting range	C	120~1000 mm	4.7 in~3 ft 3.3 in
	D	60~450 mm	2.3 in~1 ft 5.7 in

If the liquid level exceeds the high-limit set position, the high-limit alarm switch is activated, lighting up the HIGH lamp (in green) simultaneously. Set the position in terms of the distance from the ultrasonic wave transmitting/receiving surface of the HD500.

(It can be set in units of 1 mm or 0.1 inch.)

–1–A Setting the low-low limit alarm switch (LL)

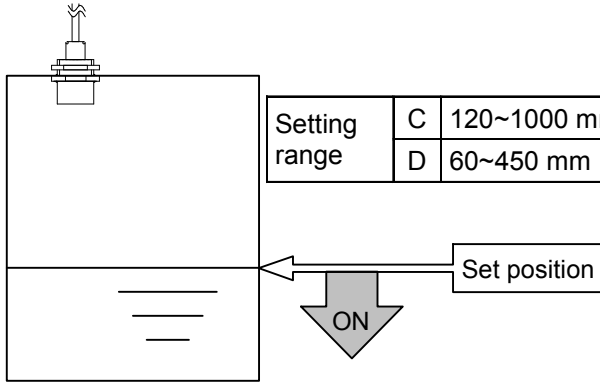


Setting range	C	120~1000 mm	4.7 in~3 ft 3.3 in
	D	60~450 mm	2.3 in~1 ft 5.7 in

If the liquid level falls below the low-low limit set position, the low-low limit alarm switch is activated, lighting up the LOW lamp (in red) simultaneously. Set the position in terms of the distance from the ultrasonic wave transmitting/receiving surface of the HD500.

(It can be set in units of 1 mm or 0.1 inch.)

–1–b Setting the low-limit alarm switch (L)



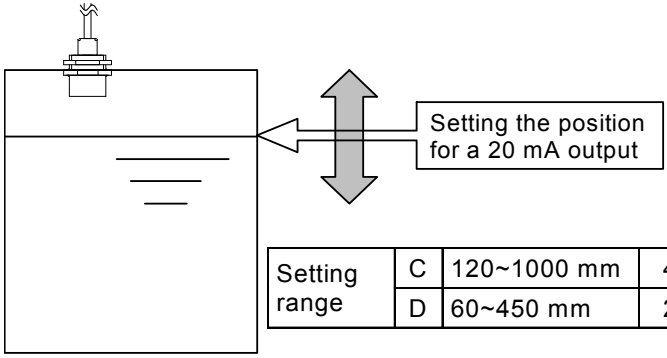
Setting range	C	120~1000 mm	4.7 in~3 ft 3.3 in
	D	60~450 mm	2.3 in~1 ft 5.7 in

If the liquid level falls below the low-limit set position, the low-limit alarm switch is activated, lighting up the LOW lamp (in green) simultaneously.

Set the position in terms of the distance from the ultrasonic wave transmitting/receiving surface of the HD500.

(It can be set in units of 1 mm or 0.1 inch.)

–2– Setting the high-limit position of current output



Setting range	C	120~1000 mm	4.7 in~3 ft 3.3 in
	D	60~450 mm	2.3 in~1 ft 5.7 in

Set the liquid level position for an output of 20 mA, in terms of the distance from the ultrasonic wave transmitting/receiving surface of the HD500.

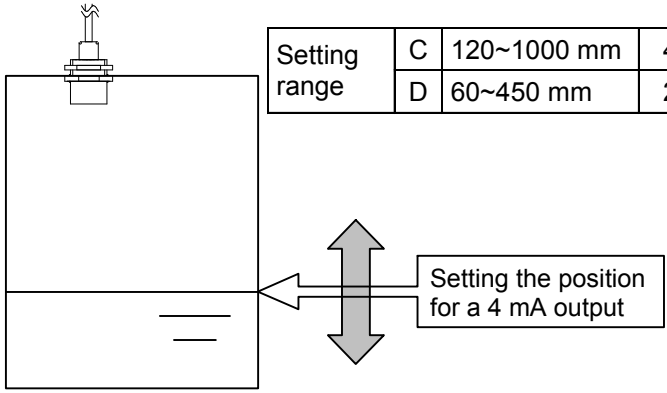
(It can be set in units of 1 mm or 0.1 inch.)

[Caution]

This setting does not function in the current measurement mode.

–3– Setting the low-limit position of current output

Setting range	C	120~1000 mm	4.7 in~3 ft 3.3 in
	D	60~450 mm	2.3 in~1 ft 5.7 in



Set the liquid level position for an output of 4 mA, in terms of the distance from the ultrasonic wave transmitting/receiving surface of the HD500.

(It can be set in units of 1 mm or 0.1 inch.)

[Caution]

This setting does not function in the current measurement mode.

Setting the liquid-level positions for outputs of 4 mA and 20 mA allows the measuring range to be determined. The rate of the remaining volume is 100% for the 20 mA output position and 0% for the 4 mA output position.

–4– Setting the data averaging times

Setting range	1~100

Set the moving average data times.

Set value	1~100	
Data variations	Large	Small
Data response	Quick	Slow
Response time	0.35 second	3.5 seconds

–5– Setting LED's usual display

Setting range	1~6

Select the usual display mode.

1. Distance display (distance from the ultrasonic wave transmitting/receiving surface of the HD500)
2. Rate of remaining volume (100.0% for the high-limit set value of current output, 0.0% for the low-limit set value of current output)
   Flow volume rate (Maximum flow volume value: 100.0%; No flow volume: 0.0%)
3. Rate of reversed remaining volume (0.0% for the high-limit set value of current output, 100.0% for the low-limit set value of current output)
   Reversed flow volume rate (Maximum flow volume value: 0.0%; No flow volume: 100.0%)
4. Display of 4–20 mA current output (Display unit: **.** mA)
5. Excessive flow position display (Display unit: **.* mm)
6. Flow volume display (Display unit: **.*** m^3/h)

–6– Temperature display

Setting range	Range cannot be set.

The menu displays sensor temperature in either degrees Centigrade or degrees Fahrenheit (selected using the –13– menu).

–7– **4 mA current output**

Setting range	Range cannot be set.

This menu outputs a current of 4.00 mA.

[Caution] The instrument outputs 4.00 mA regardless of the target distance.

–8– **20 mA current output**

Setting range	The range cannot be set.

This menu outputs a current of 20.00 mA.

[Caution] The instrument outputs 20.00 mA regardless of the target distance.

–9– **Ultrasonic reflection level display**

Setting range	The range cannot be set.

This menu displays the ultrasonic reflection level.

Display value	30~100	
Ultrasonic reflection level	Weak	Strong

–10– **Ultrasonic noise level display**

Setting range	Range cannot be set.

This menu displays the ultrasonic noise level.

Display value	30~100	
Ultrasonic noise level	Weak	Strong

[Caution]

Noise prevention method:

- Ground the F. and G. terminals.
- Place the instrument away from noise source(s).

(Provide at least 30 cm of space between the instrument and a switching power supply or other potential sources of noise.)

–11– Distance correction

Setting range	-50.0~50.0 mm	-1.96~1.96 inches

Correct the target distance in units of 0.1 mm or 0.01 inch.

–12– Follow-up rate

Setting range	0~10.0 mm	0~0.39 inches

Set the follow-up rate of the target distance.

	0	0.01~10.0 mm	
	0	0.01~0.39 inch	
Follow-up rate	Maximum	0.29 mm/second	0.12 m/second

–13– Display unit setting

Setting range	1~2

Select the unit to be displayed.

	1	2
Unit	Millimeter (mm)	Feet/inch (ft./in.)
Temperature	Centigrade (°C)	Fahrenheit (°F)

–14– STC selection

Setting range	0~5

This menu decreases the near-distance sensitivity (near-distance sensitivity correction).
This eliminates unnecessary reflected ultrasonic echoes near the sensor.

[Caution]

Generally, “0” is the standard value.
Setting a value of “1” to “5” decreases the level of ultrasonic reflection.

–15– System reset

Setting range	1

The instrument will be reset when the value is changed from “0” to “1” using the ▸ key. (This resets settings to the factory-set initial values.)

–16– **Selection of oscillation reverberation masking time**

Setting range	0~500

This menu allows users to set the oscillation reverberation masking time. The presence of deposits on the sensor may increase oscillation reverberation. Increasing the set value causes the masking time to extend, enabling normal measurements.

[Caution]

Generally, “0” is the standard value.
Note that increasing the set value may disable near-distance measurements.

–17– **Reversal of high-high limit alarm (HH) switch**

Setting range	0~1

Normal operation is enabled when this is set to “1.” When “0” is set, the ON/OFF settings of the switch are reversed.

–18– **Reversal of high-limit alarm (H) switch**

Setting range	0~1

Normal operation is enabled when this is set to “1.” When “0” is set, the ON/OFF settings of the switch are reversed.

–19– **Reversal of low-limit alarm (L) switch**

Setting range	0~1

Normal operation is enabled when this is set to “1.” When “0” is set, the ON/OFF settings of the switch are reversed.

–20– **Reversal of low-low limit alarm (LL) switch**

Setting range	0~1

Normal operation is enabled when this is set to “1.” When “0” is set, the ON/OFF settings of the switch are reversed.

–21– **Setting of current output in the event of error**

Setting range	0~2

Specify current output with respect to a “no reflected ultrasonic echo” error.
0 = Holds the current value of the last measurement
1 = Outputs a current of 4 mA in the event of an error
2 = Outputs a current of 20 mA in the event of an error

–22– Switching the measuring mode

Setting range	0~8

Selection of distance measurement or dam flow rate (formula)

0=Distance measurement

[Caution]

Only use LED's usual display 1~4 for distance measurements. Do not use LED's 5 and 6.

1= Right Triangular Dam (JIS-B8302, Numachi Kurozawa, Fuchizawa formula)

Requires settings -23-, -24-, -25-, -26-

2= Acute Triangular Dam (Watanabe formula)

Requires settings -23-, -24-, -26-, -27-

3= 60° Triangular Dam (JIS-B8302)

Requires settings -23-, -24-, -25-, -26-

4= Square Dam (JIS-B8302)

Requires settings -23-, -24-, -25-, -26-, -28-

5= Full width Dam (JIS-B8302)

Requires settings -23-, -24-, -25-, -26-

6= Right Triangular Dam (JIS-K0094)

Requires settings -23-, -24-, -26-

7= Square Dam (JIS-B0094)

Requires settings -23-, -24-, -26-, -28-

8= Full width Dam (JIS-K0094)

Requires settings -23-, -24-, -25-, -26-

Fluctuation of Operations

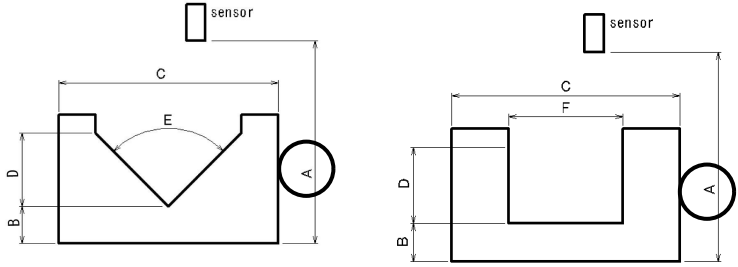
	Mode 0	Mode 1 ~ 8
Item	Level Measurement	Dam Flow Volume Measurement
4 – 20 mA	-2-, -3- setting range	Maximum flow volume 20.0 mA
% Display	-2-, -3- setting range	Maximum flow volume 100.0%
Warning Switch	Distance setting	Distance setting
RS232 Output	Distance output	Distance and flow volume output

–23– Setting bottom distance

Setting range	200.0 mm~1200.0 mm

Sets the distance from the bottom surface route of dam to the sensor.

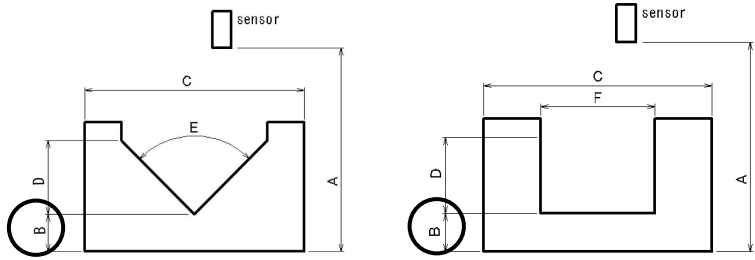
(Shown as A in the figure.)



–24– Setting dam flow route surface distance

Setting range	10.0 mm~800.0 mm

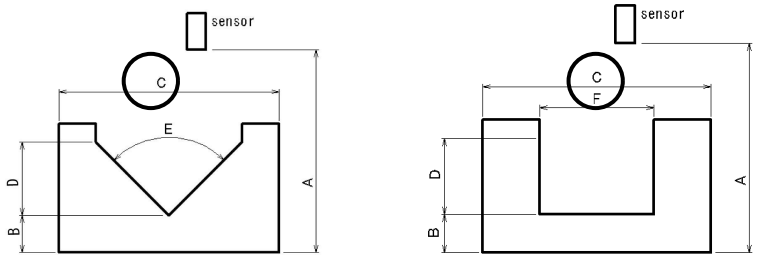
Sets the distance from the bottom surface route to the fixed point on the cut out of the dam. (Shown as B in the figure.)



–25– Setting water route width of dam

Setting range	400.0 mm~1200.0 mm

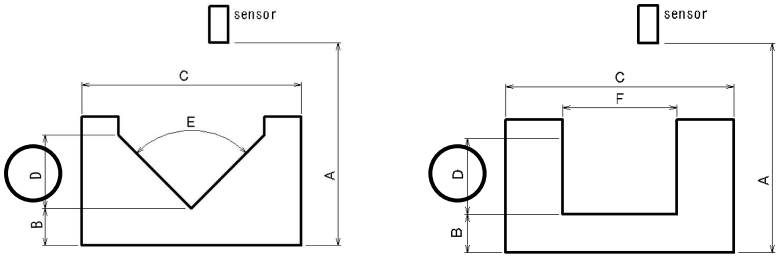
Sets the water route width of the dam. (Shown as C in the figure.)



–26– Setting Maximum Overflow Depth

Setting range	10.0 mm~300.0 mm

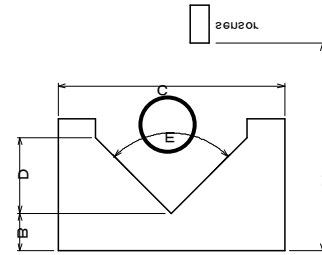
Sets the maximum overflow depth of the dam. (Shown as D in the figure.)



–27– Setting Angle of Cut Out

Setting range	45.0°~100.0°

Sets the angle of cut out of the dam. (Shown as E in the figure.)



–28– Setting width of cut out in square dam

Setting range	150~5000mm

Sets width of cut out in square dam. (Shown as F in the figure.)

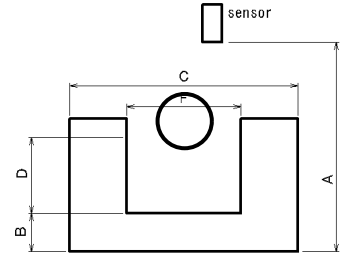
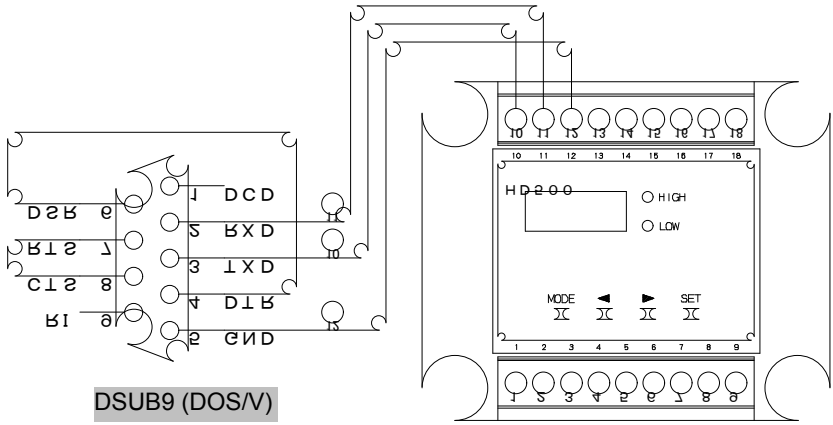


Diagram: Connecting to a Computer



DSUB9 (DOS/V)

The instrument can perform data communications using Hyper Terminal included with Windows 95 or 98 or other software.

Example: **$, 24.1, 390.7,0, 59, 39,**
Temperature, target distance, error, ultrasonic reflection level, and ultrasonic noise level

Example: **$,26.5, 265.3, 84.8, 10.565, 43.622, 24.2, 7.88, 1**
Temperature, Measurement Range, Overflow Depth, Measured Flow, Maximum Flow Volume, Measured Flow Volume Ratio, Current Output Value, Measurement Mode, [Flow Volume Unit: m^3/h]
Data output will be made approx. every 0.35 second.

External setting commands

Setting item	Setting command and example	D (400 kHz) / C (200kHz)
High-high limit switch (HH)	$,MODE0A,140,	60~450/120~1000
High limit switch (H)	$,MODE0B,140,	60~450/120~1000
Low-low limit switch (LL)	$,MODE1A,400,	60~450/120~1000
Low limit switch (L)	$,MODE1B,400,	60~450/120~1000
Current output high-limit position	$,MODE2,140,	60~450/120~1000
Current output low-limit position	$,MODE3,400,	60~450/120~1000
Data averaging times	$,MODE4, 50,	1~100
Distance correction	$,MODE11, 0,	-500~500
Follow-up rate	$,MODE12, 1,	0~100

Set values may be modified from an external computer.When an external setting command is sent and the relevant item is set correctly, the instrument returns a setting command.

Troubleshooting

Problem	Possible cause	Remedy
The instrument cannot be turned on. (No LED lights up.)	Power line not wired. Incorrect wiring	Connect a 12 ~ 24 V DC adapter to the instrument.
Measurements cannot be made.	The installation angle of the sensor is incorrect, disabling the return of reflected ultrasonic waves.	Adjust the installation angle of the sensor. Position the sensor so that the ultrasonic wave transmitting/receiving surface is parallel with the surface of the liquid.
An incorrect distance is displayed.	Another reflector is within the path of the ultrasonic beam.	Remove the unwanted reflector or change the location of the sensor.
The measured distance is inconsistent.	Data averaging time small. Follow-up rate fast	Increase the data averaging times. Reduce the follow-up rate to a smaller number (except “0”).
A displayed measured distance is double the correct value.	The ultrasonic wave was reflected twice.	Change the location of the sensor.
The measured value for near distance is incorrect.	A reflector is present within the minimum measurement distance.	Secure the minimum measurement distance.

Specifications

	HD500-C2	HD500-D2
Ultrasonic frequency	200 kHz	400 kHz
External dimensions	113 x 94 x 52.5 mm	←
Sensor	ϕ 42 x 39 mm	←
Power supply	12~24 V DC (10~28 V), 3 W (maximum)	←
Standard measurement range	120~1000 mm	60~450 mm
Object to be measured	Liquid (flat shape)	←
Beam angle	10°	5°
Memory backup	EEPROM	←
Operating temperature	0~50°C	←
Storage temperature	-30~80°C	←
Data averaging times (Moving average time)	1~100 times (0.35~3.5 seconds)	←
Display	4-digit LED (in 0.1 mm) Error indication (- - - -)	←
Setting	Keyboard settings Setting of high-high, high, low, and low-low limit alarm output switches Setting of high- and low-limit positions for current output Data averaging setting Switching the unit to be displayed (mm, %, mA)	←
Output	Alarm output switches NPN open collectors Two for high limit points and two for low limit points 4–20 mA current output RS232C (9600 bps)	←
Resolution	Internal resolution 0.1 mm (RS232C) Display resolution In 0.1 mm Setting resolution In 1 mm	←
Temperature compensation sensor	-20~70°C Display: in 0.1°C, Accuracy: within ±2°C	←
Measurement accuracy	±0.25%F.S.	←
Material	Instrument: ABS, Sensor: PFA	←
Box construction	Instrument: IP43, Sensor: IP65	←
Weight	Instrument: 300 g, Sensor: 150 g	←

After-sales Service

◆ Warranty Card

The warranty period is one (1) year after the date of purchase. When purchasing the product, always check that the warranty card includes the purchase date, the name of your distributor, and the serial number, carefully read the information contained in the card, and store it in a readily accessible location.

Please note that if the warranty card does not include the necessary information, Honda Electronics may charge fees for repairs even within the period of warranty.

◆ Requests for Repairs

Always consult the Troubleshooting section of this manual when you encounter a problem. If the problem persists after taking the measures specified in this manual, follow the procedure below.

- Within the warranty period:

  Contact your distributor for repairs; have the warranty card handy.

  * Carefully read the information in the warranty card, as charges may apply to certain repairs even during the warranty period.

- If the warranty period has expired:

  Contact your distributor. The product will be repaired (if possible) for a charge.

  * When requesting repairs, provide information on the location and nature of the problem.

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