

ONWA[®]
KES-700

KES-700
OPERATOR'S MANUAL

NAVIGATIONAL ECHO SOUNDER

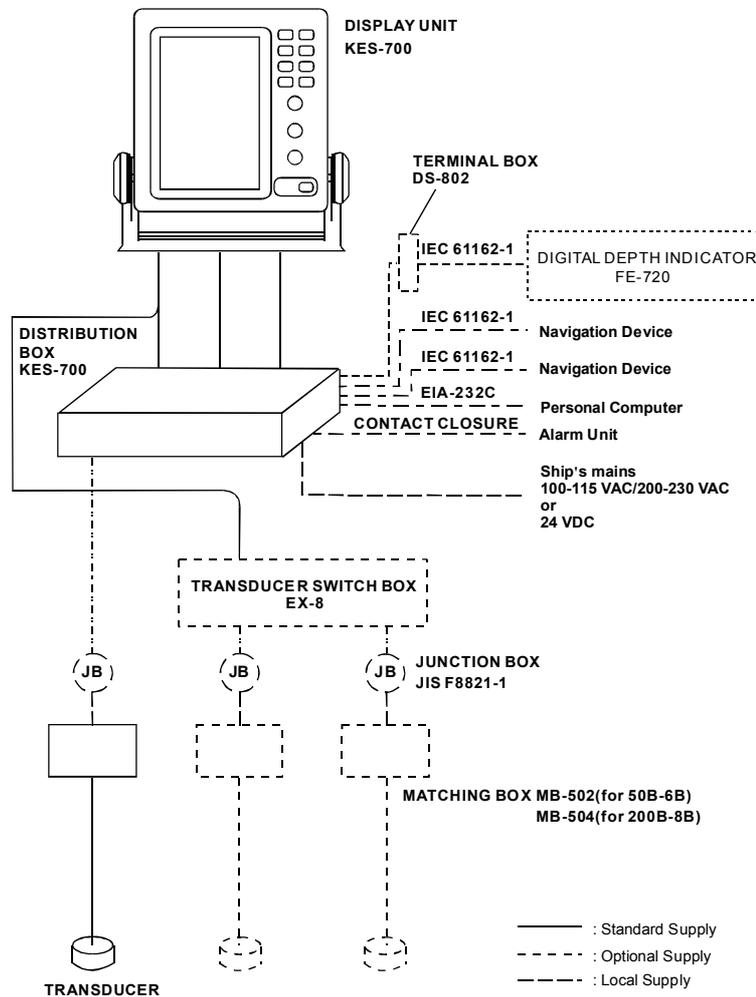
FOREWORD

The ONWA KES-700 is comprised of display unit and transducer unit. Echo sounding data is displayed on the bright 10.4-inch color TFT (Thin Film Transistor) LCD display.

The main features of the FE-700 are

1. Complies with the IMO and ISO standards MSC.74(69) Annex 4 and ISO9875.
2. Cost-effective; no paper, no consumables; high accuracy and high reliability - no rotating gears and belts as in the paper echo sounders
3. High-contrast 10.4-inch color LCD display featuring a wide viewing angle and adjustable brightness.
4. Wide variety of modes with never-get-lost default position.
5. Automatic function permits unattended adjustment of range, gain, and pulselength. The range scale and gain automatically change to display the bottom.
6. Position, course, speed, time are repeated from the external devices.
7. Alarms: shallow water, bottom lost, power drop.

SYSTEM CONFIGURATION



PRINCIPLE OF OPERATION

The FE-700 uses ultrasonic pulses to detect the seabed and other underwater objects. The display unit contains all basic electric circuits and logic processor. Electrical pulses are converted into acoustical energy in the transducer fitted on the ship's hull. The processor measures the time of pulses travelling between the seabed and transducer and displays the water depths in the graphical form or other forms.

The transducers have a specific beam width with respect to their working frequency, 50 kHz or 200 kHz. The high frequency has a narrow beamwidth and is immune to aeration when the ship is going astern or in rough weather. The low frequency has a wide beamwidth and more powerful sounding capability.

SPECIFICATIONS

1.DISPLAY UNIT

1.1 Graphical Display 10.4-inch color TFT LCD, 320 x 234 pixels

1.2 Echo Colors 8 colors or 8 level monochrome

1.3 Display Area: 213.2mm×160.4mm

1.4 Basic Display Range

Unit	Range							
	1	2	3	4	5	6	7	8
Meters	5	10	20	40	100	200	400	800
Feet	15	30	60	120	300	600	1500	2500
Fathoms	3	5	10	20	50	100	200	400

*Default settings; it could be customized for use w/o range 3 and 6.

1.5 Accuracy $\pm 2.5\%$ on any range

1.6 Minimum Range 0.5 m (200 kHz), 2.0 m (50 kHz)

1.7 Draft -10 to 30 m in 0.1 m steps, default 0 m

1.8 Pulse Repetition Rate (PRR)

Depth (m)	P/L (ms)	PRR (pulse/min)
5, 10, 20	0.25	750
40	0.38	375
100	1.00	150
200	2.00	75
400, 800	3.60	42

1.9 Display Mode

- "NAV": Basic echo presentation with the depth below transducer
- "DBS": Echo presentation with the depth below sea surface (or keel)
- "HISTORY": Historical Echo presentation with the depth
- "LOGBOOK": Echo presentation with the pop-up table showing Time, Depth and L/L* data memorized at preset interval
- "OS DATA": Echo presentation with the pop-up table of present navigational data; L/L*, course*, speed*, time, depth
- "HELP": Echo presentation with the help menu and note
- "MENU": Echo presentation with the user menu

1.10 Picture Advance Speed

- Slow mode 15 minutes or more
- Fast mode Picture advance range

Range (m)	5	10	20	40	100	200	400	800
Interval (min)	1.8		8		20		30	

1.11 User Setting

Gain, Range, Alarm, Draft, Brilliance, Dimmer, Color, Auto

1.12 Auto Set Mode

Gain, range and clutter will be automatically adjusted.

1.13 Alarm

Shallow water (default 20 m), Bottom lost, Power drop

1.14 Logbook Display

Depth, Internal clock, L/L* 1 hour at 5 sec Interval, 12 hours at 1 minute interval and 24 hours at 2 minutes interval.

*: External navigational sensor required.

2.TRANSCEIVER CHARACTERISTICS (BUILT IN DISPLAY UNIT)

2.1 Transmit Frequency	50 kHz or 200 kHz
2.2 Output Power	600 Wrms

3.DIGITAL DEPTH INDICATOR

3.1 Display	10.4-inch monochrome LCD
3.2 Depth Indication	**.* m (less than 100m) **** m (100 m or more)
3.3 Power supply	24 VDC, 150mA
3.4 Coating color	Panel: N3.0, Chassis: 2.5GY5/1.5
3.5 Waterproofing	IPX5

4.TRANSDUCER TYPE AND BEAMWIDTH

4.1 50B-6B (50 kHz):	35°
4.2 200B-8B (200 kHz):	6°

5.INTERFACE

5.1 Serial Input Data	IEC61162-1, current loop; 1 port RMA: L/L, ground track speed, Track RMC: L/L(GPS), ground track speed, Track, Time GLL: L/L GGA: L/L VTG: Ground track speed, Track (True/Magnetic selected on menu) ZDA: Time
5.2 Serial Output Data	IEC61162-1, output period:1 sec.;3 outputs/1 port SDDPT: Depth (m), Draft (m) SDDBT: Depth (ft, m, fa) below transducer SDDBS: Depth (ft, m, fa) below sea surface

5.3 Serial I/O Data RS-232C, 1 port
Output Depth, clock, L/L, ship's speed, course
SP - 3 E2366S01Q
Input Control command for PC

5.4 Alarm (Depth, Power) Contact closure signal, normal open or normal close,
250 VAC/ 200 VDC, 3A max.

6.POWER SUPPLY

24 VDC (-10%, +30%): 20W or 100-115/200-230 VAC,
1 phase, 50/60Hz: 20VA.

7.ENVIRONMENTAL CONDITION

7.1 Temperature -15°C to +55°C

7.2 Relative Humidity 93% or less at 40°C

7.3 Waterproofing Display Unit: IEC IPX5
Distribution Box: IEC IPX2
Matching Box: IEC IPX2

7.4 EMC Emission IEC 60945 Ver.3

7.5 Category of Equipment Units

Display Unit	protected from the weather
Distribution Box	protected from the weather
Matching Box	protected from the weather
Transducer	Submerged area

8.COATING COLOR

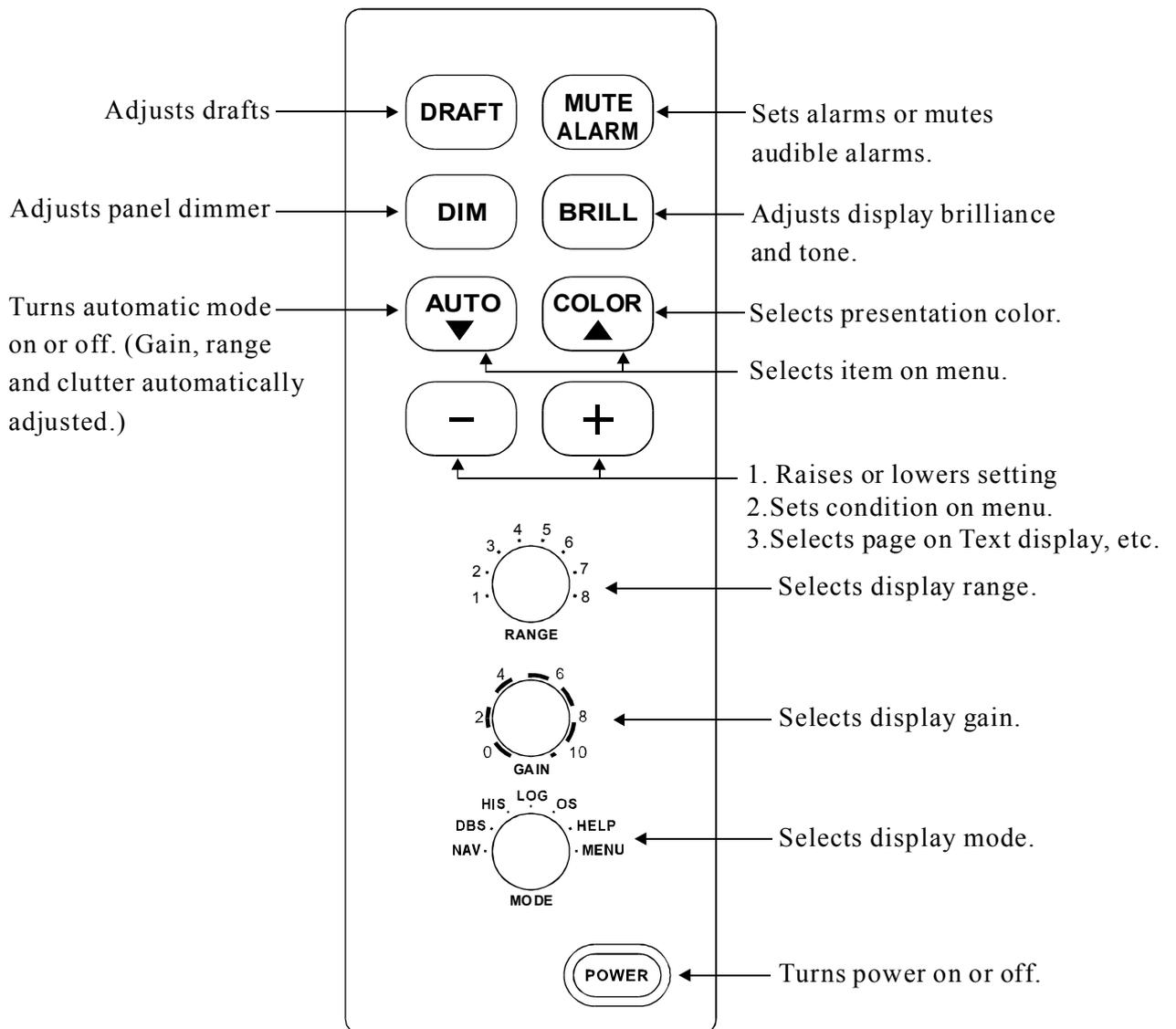
8.1 Display Unit Panel: N3.0, Chassis: 2.5GY5/1.5

8.2 Distribution Box/ Matching Box
2.5GY5/1.5

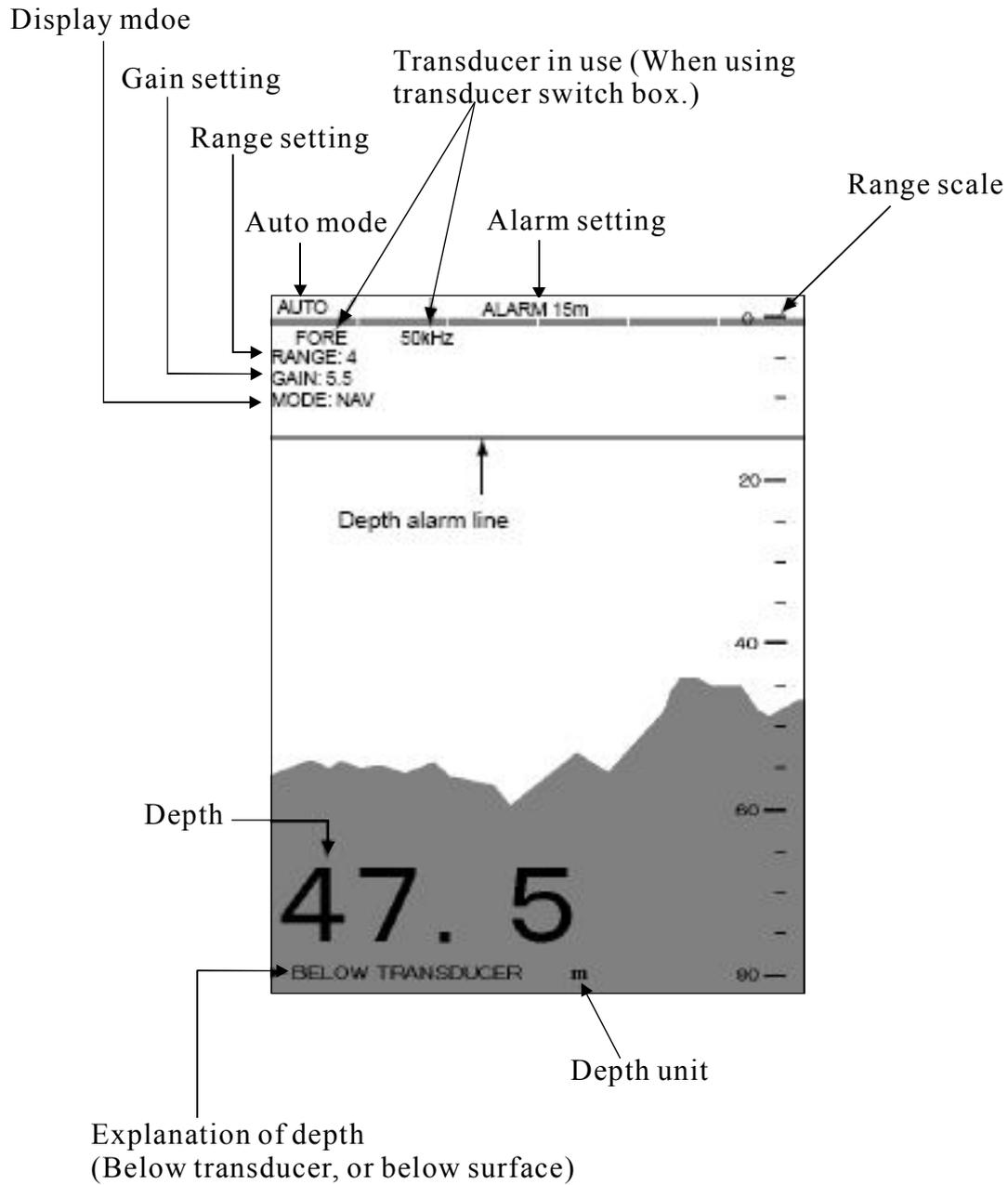
1. OPERATION

1.1 Control Description

All operation of the KES-700 is carried out with the controls on the front panel of the display unit. Rotary controls respond immediately to your command but some touch keys require the successive operation.



1.2 Indications, Markers



1.3 Turning On/Off

Press the [POWER] key. The unit beeps and display "ONWA" logo. After a few seconds starts up with the last-used display mode.



2. Select a mode with the MODE Selector. The NAV position of the selector is recommended for general use. Display color is amber by default but may be customized. The unit of measurement is meters. You can freely select another mode at any time.

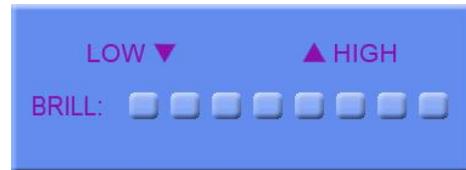
Note: When lat/long data input error occurs, "EPFS" ERROR appears on the screen. (EPFS: Electronic Position-Fixing System such as GPS receiver)

3. **Turning off:** Press the [POWER] key.

Note: When two transducers are installed, make sure which transducer is used.

1.4 Tone and Brilliance

1. Press the BRILL key. The tone and brilliance setting window appears.



2. Press the [+] or [-] key for desired tone (in reality, Contrast).
3. Press the [▲] or [▼] key for desired brilliance. Pressing the BRILL key also changes the brilliance from minimum to maximum and vice-versa.

Note: Tone or brilliance must be adjusted within 10 seconds after pressing the BRILL key. Otherwise the tone and brilliance window will be erased.

1.5 Panel Dimmer

1. Press the DIM key. The panel dimmer setting window appears.



2. Press the [+] or [-] key for desired illumination of the control panel. Pressing DIM key also changes the illumination level.

1.6 Display Mode

The Mode Selector choose the display mode among NAV, DBS (depth below surface), HISTORY, LOGBOOK, OS DATA, HELP and MENU.

1.6.1 NAV mode

The depth from the transducer to the seabed (bottom clearance) is shown on the screen. Note "BELOW TRANSDUCER" appears at the bottom of the screen in this mode.

Default is,

Color: Amber

Range: Automatic range switching

Window: 15 minutes

Shallow depth alarm: 20 m

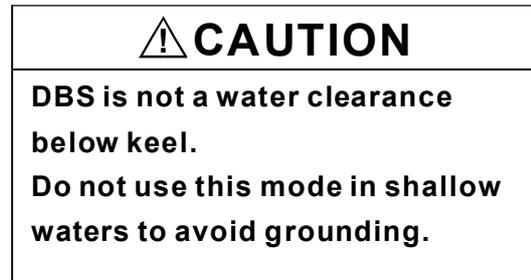
NOTE: These parameters can be customized to your preference and the last setting is used at a next switch-on. This is true on all other modes.

1.6.2 DBS mode

The Depth Below Surface mode provides a draft-adjusted depth reading and will be useful inreferencing to the nautical chart. The draft should be adjusted by the DRAFT key according to the actual draft value. If you find any difficulty to check for the draft value, use the NAV mode.

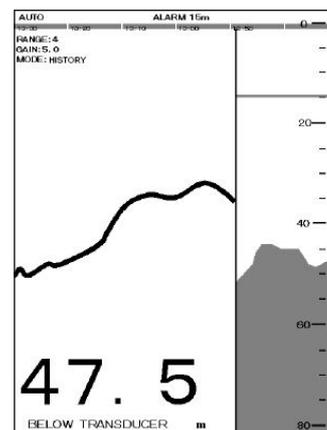
When the DBS mode is selected, the message "Confirm and set ship's draft to use DBS mode" appears. Confirm ship's draft and set it by referring to section 1.12.

BELOW KEEL (when the draft setting is -10.0 to -0.1) or BELOW SURFACE (when the draft setting is 0 to 30.0) appears at the bottom of the display and the draft value appears at the upper right-hand corner in the DBS mode.



1.6.3 HISTORY mode

This mode provides a mix of Contour and Strata displays. The Contour display can be scrolled over the past 24 h while the right side Strata display (layers of different colors according to reverberation strengths) shows the latest sounding for 5 minutes. Pressing the [+] or [-] key moves the Contour display forwards or backwards, respectively.



If the range scale for both the Contour and Strata display must be the same. If they are not, the message "OUT OF RANGE" appears. The update of the contour data may take max. one minute. Wait for one minute to display accurate contour if you change the range scale.

1.6.4 LOGBOOK mode

The LOGBOOK shows time, depth and own ship position in tabular form in a pop-up window. The logging is selected with the INTERVAL option on the menu among 5 s, 1 min and 2 min. (See section 2.6.)

There are 60 pages and the total memory capacity is 720 points. Page 60/60 is the latest data and 1/60 is the oldest data. Pressing [-] or [+] key changes the pages.

TIME	DEPTH	L/L
11:05:00	47.5	36° 55.012'N 135° 23.123'E
11:06:00	47.5	36° 55.012'N 135° 23.123'E
11:07:00	47.5	36° 55.012'N 135° 23.123'E
11:08:00	47.5	36° 55.012'N 135° 23.123'E
11:09:00	47.5	36° 55.012'N 135° 23.123'E
11:10:00	47.5	36° 55.012'N 135° 23.123'E

1.6.5 OS DATA mode

This display mode indicates own ship position, GPS-derived course and speed, and time and depth in digital form. You can read the data of your particular interest in large characters. The screen continues to display the sounding data in the background. Part of graphical indication is visible to the right of data slips.

POSITION	34° 12.345'N 135° 12.345'N
COURSE	132°
SPEED	12.3 kt
TIME	09:55:38
DEPTH	47.5m

There are two kinds of OS DATA displays: DATA 1 and DATA 2, as selected on the system menu. DATA 1 is the default setting, and it is shown in the figure above. The DATA 2 display is as below.

TIME	09:55:38
DEPTH	47.5m

Note: When lat/long data input error occurs in the DATA 1 mode, .EPFS. ERROR appears on the screen. (EPFS: Electronic Position-Fixing System such as GPS receiver)

Enlarging data of interest

You can enlarge one of the data indications as follows:

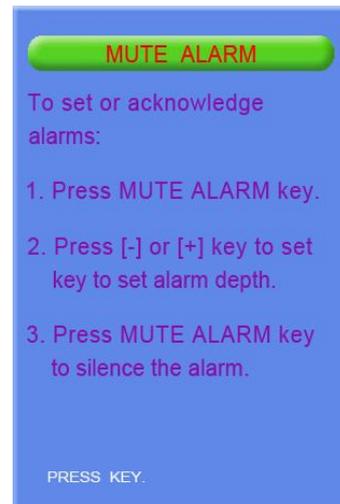
1. Press the [▲] or [▼] key to select the data you want to enlarge. Current section is circumscribed with the blue cursor. For example, select the depth cell.
2. Press the [+] key.



3. To return to the original display, press the [-] key.

1.6.6 HELP display

This mode provides information about keys. Press desired key to obtain the corresponding information. The example below shows help information for MUTE ALARM.

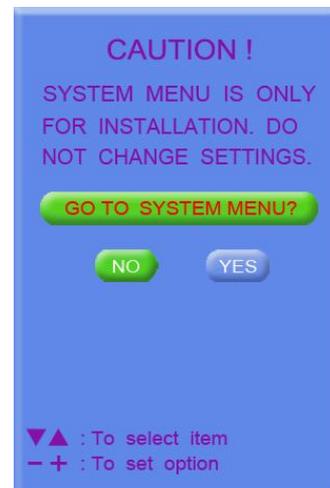


1.6.7 MENU display

The menu provides functions which normally do not require frequent adjustment. For details see Chapter 2.



Press the [▼] key, and the following appears.



1.7 Range Scale

If the depth goes out of the correct display area, increase or decrease the range until the seabed appears near the center of the screen.

Adjust the Range Control, and current range selection is shown in the range display window.



In the AUTO mode, the range scale is automatically adjusted. See section 1.9 for details.

1.8 Gain Control

The GAIN Control adjusts the sensitivity of the receiver. The AUTO mode provides automatic adjustment and you are normally not required to adjust it. Current setting is shown at the upper left-hand corner. Adjust the GAIN Control and the following window appears.



Adjust the GAIN Control so that a slight amount of noise remains on the screen. Generally, use a higher gain setting for greater depths and a lower setting for shallower waters. Adjusting range is between 0.0 and 10.0 in 0.5 steps.

1.9 Automatic Operation

The automatic function automatically selects the proper gain, range scale and clutter level according to depth. It works as follows:

- The range changes automatically to locate the bottom on the lower half of the screen. It jumps to one step shallower range when bottom echoes reach a halfway point of the full scale from top and to one step deeper range when they come to the lower edge of the scale.
- The gain is automatically adjusted to display the seabed in specified color.
- Clutter level (on the menu), which works as a threshold control to suppress overall noise, is automatically adjusted.

Note: The AUTO MODE is cancelled whenever the range or the gain is changed.

How to enable/disable automatic operation

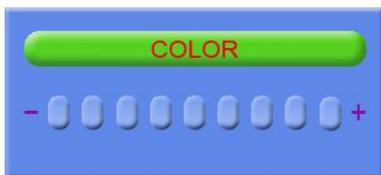
1. Press the **AUTO** key. The AUTO mode window appears.



2. Press the [+] key to select ON or the [-] key to select OFF.

1.10 Picture Colors

1. Press the COLOR key. The following window appears.



2. Press the [+] or [-] key to select a number, referring to the table below. (You can see the result of your selection on the display.)

	Background	Seabed	Others marks
1	Monochrome, 8 intensities		
2	Blue	Red infill	6 colors
3	Black	Red infill	6 colors
4	White	Red infill	6 colors
5	Blue	Yellow infill	6 colors
6	Black	Yellow infill	6 colors
7	White	Yellow infill	6 colors
8	Black	7 colors (Strata)	
9	White	7 colors (Strata)	

Monochrome (amber) is the default setting. The Strata display contains multiple colors depending on the reflectivity from underwater objects of the sounding pulses. Red is strongest, followed by brown, orange, yellow, blue, and light blue.

1.11 Shallow Depth Alarm

The shallow depth alarm sounds when the seabed is shallower than the preset depth. The default in the NAV position is 20 m. You can adjust the alarm depth as below:

Activating/deactivating the alarm

1. Press the MUTE ALARM key to display the depth alarm setting window.



2. Press the [+] or [-] key to change setting depth. The setting is shown digitally at the top of the screen and graphically key the depth alarm line.

When the alarm is activated, the message "SHALLOW DEPTH ALARM" is displayed at the center on the screen.

Note: When the draft setting is - 10.0 to - 0.1 in the DBS mode, the shallow depth alarm setting will show a minus value. At this time, the alarm setting value indication shows "*****" and the alarm function is disabled.

Acknowledging the alarm

You can silence the alarm by pressing the MUTE ALARM key. The message "SHALLOW DEPTH ALARM" moves to upper side of the screen.

1.12 Draft

It is necessary to set the draft to use the DBS display mode, which shows depth below surface.

1. Select DBS with the MODE control.
"Confirm and set ships draft to use DBS mode." appears.
2. Press the DRAFT key to display the draft setting window.



3. Press the [+] key to increase the setting depth and [-] key to decrease it. The setting depth is -10 to 30 m in steps of 0.1 m.

The above window disappears in 10 seconds. The draft setting is displayed at the upper right corner and the range scale is shifted according to the draft setting.

2.MENU OPERATION

2.1 Menu Overview

The menu has several functions for advanced operation.

1. Select MENU with the MODE Selector.



2. Press the [▲] or [▼] key to select menu item. As you operate the [▲] or [▼] key, the selected item and its current setting appear in reverse video.
3. Press the [-] or [+] key to select option desired.
4. Set the MODE Selector in another position to close the menu.

2.2 Suppressing Low Level Noise

Light-blue dots may appear overall screen. This is mainly due to dirty water or noise. This noise can be suppressed by adjusting CLUTTER (in reality, Threshold of the amplifier).

When the automatic mode is on, the suppression setting is automatically adjusted. For manual override, do the following:

1. Select MENU with the MODE Selector.
2. Select CLUTTER by pressing the [▲] key.
3. Press the [-] or [+] key to select clutter rejection level desired. The higher the number the higher the degree of suppression. Note that weak echoes may not be displayed when the clutter circuit is on.

2.3 Suppressing Interference

Interference from other acoustic equipment operating nearby or other electronic equipment on your boat may show itself on the display.

To suppress interference, do the following:

1. Select MENU with the MODE Selector.
2. Select INTERPERENCE REJECT by pressing the [▲] or [▼] key.
3. Press the [-] or [+] key to select degree of suppression desired; OFF, IR1, IR2 or IR3. The higher the number the greater the degree of suppression.

Note that oversuppression will weaken the sensitivity.

2.4 Picture Advance

The picture advance speed determines how quickly the vertical scan lines run across the screen.

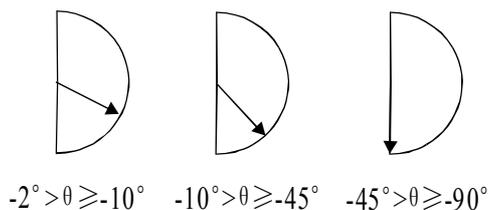
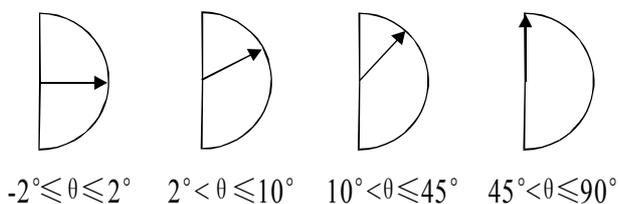
1. Select MENU with the MODE Selector.
2. Select PICTURE ADVANCE by pressing the [▲] or [▼] key.
3. Press the [+] or [-] key to select speed FAST or SLOW, respectively. The advance speed varies with the range scale and the viewing length of 15-16 minutes is available on all ranges (IMO requirements).

Range (m)	Display window (minute)
5, 10, 20	1.8/15 (FAST/SLOW)
40,100	8/15
200	15/20
400, 800	15/30

2.5 Trend

The future trend of the seabed depths can be predicted over a specified period of time (See page 13). The trend index is set with the item TREND and appears at the top left corner. The default setting is ON.

θ is inclination angle of bottom.



2.6 Interval

The interval for sampling data for the LOGBOOK and HISTORY modes can be set with INTERVAL, among 5 s, 1 min and 2 min. The default setting is 1 min.

TIME	DEPTH	L/L
11:05:00	47.5	36° 55.012'N 135° 23.123'E
11:06:00	47.5	36° 55.012'N 135° 23.123'E
11:07:00	47.5	36° 55.012'N 135° 23.123'E
11:08:00	47.5	36° 55.012'N 135° 23.123'E
11:09:00	47.5	36° 55.012'N 135° 23.123'E
11:10:00	47.5	36° 55.012'N 135° 23.123'E

In this example, the setting of INTERVAL is 1 minute. That is, the depth and lat/long data are displayed at 1 minute intervals.

3.SYSTEM MENU

3.1 System Menu

The system menu should be set just after installation and is not always necessary to be adjusted. If you change any items of the system menu or even if you open the system menu, the sounding picture will be cleared. There are three menus: 1,2,and 3.

1. Select MENU with the MODE Selector.



2. Press the [▼] key several times to display following window.



3. Select YES by pressing the [+] key.

Confirmation message

"ARE YOU SURE?" Appears.

4. Press the [+] key again.

The system menu 1 appears.

5. With the cursor selecting MENU SELECT, operate the [-] or [+] key to select system menu desired; 1, 2 or 3.



▼ Press [+] at menu 1.

▲ Press [-] at menu 2.



▼ Press [+] at menu 2.

▲ Press [-] at menu 3.



3.2 System Menu 1

DEPTH UNIT: Selects unit of depth measurement among meters, feet, or fathoms. Default setting is meters.

If "ft" or "fa" is selected, the depth unit is shown in red characters.

SPEED UNIT: Selects unit of speed measurement among knots, statute miles per hour, or kilometers per hour. Default setting is knots. Requires speed data, from external device.

COURSE: Selects heading reference; true or magnetic. Default setting is TRUE.

BOTTOM LOST: Turns on or off the bottom loss warning. "ALARM" sounds the alarm if the bottom signal is not detected. Default setting is "ALARM" (alarm is enabled).

GPS ALARM: The audible alarm may be released when the position-fixing mode is switched from DGPS to GPS and vice versa. Default setting is "ALARM" (alarm is enabled). Choose "OFF" if you do not need to be alerted with the audible alarm when the position-fixing mode is switched.

INTERFACE: Selects I/O signal format between the FE-700 and external equipment; IEC format "1:95" (1995 version) or "1:98" (1998 version), or NMEA format. Default setting is IEC "1:98".

When selecting the "1:98", DPT has max. range in use (See page 24).

	Output	Input
IEC 61162-1	DPT	RMA, RMC GLL, VTG ZDA, GGA
NMEA 0183	DBT (Ver.1.5) DBS (Ver.1.5) DPT (Ver.2.0)	RMA, RMC GLL, VTG ZDA, GGA

OS DATA: Selects own ship data display mode; DATA 1 or DATA 2. DATA1 is the default setting.

If a navigation device is not connected to the FE-700, select DATA 2.

LANGUAGE: Currently English is only available.

3.3 System Menu 2

TIME ADJUST: Selects internal clock or external clock (UTC clock). Default setting is INTERNAL.

For INTERNAL, set current day, month, year, hour, minute and second with [+], [-], [▼] or [▲] key. The setting clock appears and it counts upward.



If EXTERNAL is selected, the screen changes as follows.



TIME DIFFERENCE: Selects auto (UTC) or manual. Auto uses the time difference in ZDA (IEC 61162-1). In manual, it is necessary to enter the time difference in hours and minutes.



3.4 System Menu 3

RANGE 1- 8: Activates or deactivates specific range scales. Default ranges are 5, 10, 20, 40, 100, 200, 400, and 800 (meters). Setting area is 2 m to 800 m. The ranges 20m and 200 m can not be changed. They are essential in this equipment.

Note: Ranges must be set in numerical order. For example, if range 1 is 5 m and range 3 is 20m, range 2 should be between 6 and 19 m.

Trend: The trend index shows the probable bottom shape over a specified time within 1-10 minutes. The default setting is 1 minute. Set the Trend time with [+] or [-].

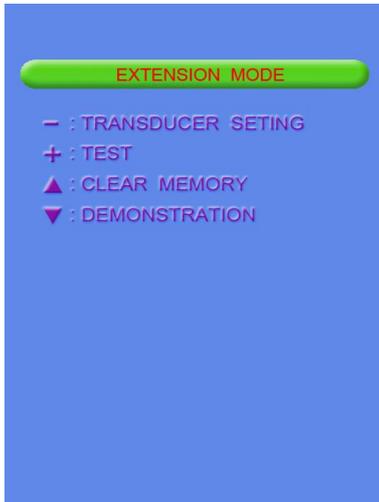
4 ECHO QUALITY SETTING

This chapter describes functions useful for improving echo sounding performance.

4.1 Demonstration Display

The demonstration program shows how the FE-700 works.

1. Turn off the equipment.
2. Press the POWER Switch while pressing any key. Release the key when the following EXTENSION MODE display appears.



3. Press the [▼] key to select DEMONSTRATION.



4. Press the [+] key to select ON.
5. Reset the power. "DEMO" appears above the depth indication on the echo sounder displays and at the top right-hand corner on the data and graphic displays.

- To return to the normal operation, select OFF at step 4 above. Restart the display unit after waiting 5 s.

4.2 Transducer Setting

After installing the equipment, set the transducer as follows.

1. Press the [+] key at the EXTENSION MODE display. The following window appears.



2. Set as follows by using [▲] or [▼] to select an item and [+] or [-] to set option.

- a) If only one transducer is installed, set XDR FORE field to 50 kHz or 200 kHz, according to actual installation. Leave the XDR AFT field as N/A.

b) If two transducers are installed via the switch box EX-8, set XDR FORE field and XDR AFT field to 50 kHz or 200 kHz, according to actual installation.

3. Reset the power.

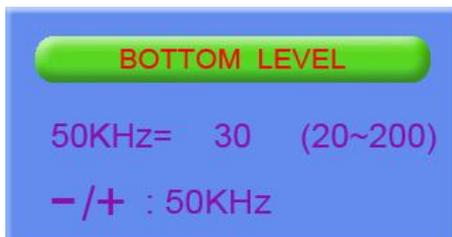
Note: The default settings in the TRANSDUCER SETTING window are N/A. At the first power-up after installation, the window appears to set transducer(s).

4.3 Bottom Level

If the depth indication is unstable or the seabed cannot be displayed steadily notwithstanding the adjustment of the control panel, you may adjust the bottom echo level.

CAUTION
If the level is set too low, the FE-700 may not be able to distinguish the bottom from fish echo and the depth indication may be unstable and if set to high the depth indication does not appear.

1. Press the MUTE ALARM key three times at the EXTENSION MODE. The start-up screen appears and shortly thereafter the BOTTOM LEVEL display appears.



*: Either 200 kHz or 50 kHz is displayed depending on which frequency is used.

2. Set the level with the [+] or [-] key. The default level is 80.
3. Press the POWER switch to finish the adjustment. Wait about 5 s and then turn on the power again.

4.4 TVG Level

TVG (Time Varied Gain) compensates for propagation attenuation of the ultrasonic waves, reducing surface noise to provide a smooth display. The TVG lowers receiver sensitivity at the time of pulse emission and gradually increases it with time, thereby making objects of same reflectivity at different depths appear at the same intensity or colors on the display. The TVG working depth is down to approximately 150 m on the 200 kHz system and 350 m on the 50 kHz system. Outside this range the echoes from the seabed and fish schools are received in full level.

There is no perceivable deterioration in performance.

1. Press the DRAFT key three times at the EXTENSION MODE display. The TVG SELECT window appears.

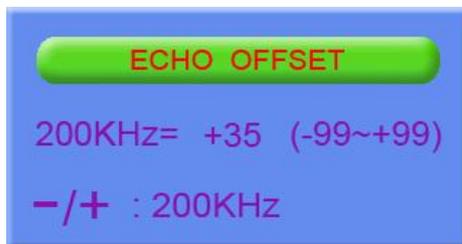


2. Set the TVG curve with [+] or [-]. The default level is 5. Attenuation compensation curve is at 20LogR curve.
3. Press the POWER switch to finish the adjustment. Wait 5 s, and then turn it on again.

4.5 Echo Offset

The echo offset feature functions to compensate for too weak or too strong echo level. If the onscreen echo level appears to be too weak or too strong and the level cannot be adjusted satisfactorily with the GAIN control, do the following to adjust echo level.

1. Press the DIM key three times at the EXTENSION MODE display. The ECHO OFFSET screen appears.



2. Set the offset with [+] or [-]. The default value is 0.
3. Press the POWER switch to finish the adjustment. Wait about 5 s and then turn it on again.

5 MAINTENANCE, TROUBLESHOOTING

WARNING

DO not open the cover.
There are no user-serviceable parts inside.
Refer any repair work to a qualified technician.

5.1 Checking

Regular maintenance is essential for good performance. Checking the items listed in the table below on a regular basis will keep the equipment in good shape for years to come.

Item	Action
Cable run	If conductors are exposed, replace cable.
Power cable, transducer cable plug	If loosened, tighten.
Display unit ground	If corroded, clean.
Ship's mains voltage	If out of rating, correct problem.

5.2 Cleaning the Display Unit

Dust or dirt on the display unit should be removed with a soft cloth. If desired a water-moistened cloth may be used. Do not use chemical cleaners; they can remove paint and markings.

5.3 Transducer Maintenance

Marine life on the transducer face will result in a gradual decrease in sensitivity. Check the transducer face for cleanliness each time the ship is dry-docked. Carefully remove any marine life with a piece of wood or fine-grade sandpaper.

5.4 Replacing the Fuse, Battery

If a fuse blows, find the cause before replacing it. Use only designated fuses. Using the wrong fuse will damage the unit and void the warranty.

Three types of fuses are used in the distribution box KES-700.

For Display Unit : 3 A x 1 pc (24 VDC)
For Digital Depth Indicator: 0.5 A x 2 pcs
For AC input: 1 A x 2 pcs

The Digital Depth Indicator FE-720 uses one fuse of 1 A, which is inserted in the positive line of interconnection cable.

A battery installed on a circuit board inside the display unit preserves data when the power is turned off. The life of the battery is about three years. When the battery voltage is low, "battery" NG appears at the self-test. When this happens, contact your dealer to request replacement of the battery.

	TYPE	Code Number
Lithium Battery	CR2450-F2 St2	000-133-495

5.5 Troubleshooting

The table below provides simple troubleshooting procedures which you may follow to restore normal operation. If you cannot restore normal operation, contact your dealer.

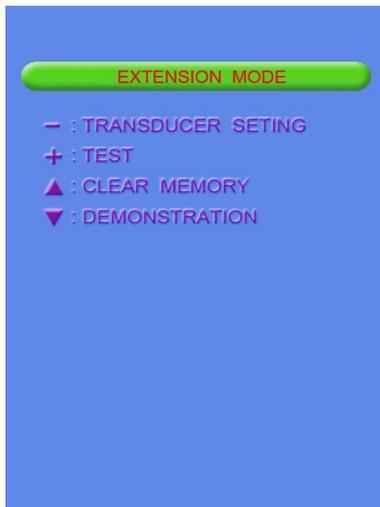
PROBABLE CAUSES REMEDY

SYMPTOM	PROBABLE CAUSES	REMEDY
No picture; no reading measure	Low power supply	Check the supply voltage.
	Fuse blown	Replace the fuse.
	Power cable damaged	Check the cable and repair.
No echo sounding picture	Transducer cable damaged	Repair the cable.
	Transducer cable connection loosened	Tighten the connections.
	Transmitter not working	Make sure the maximum output power is selected. (See section 3.2 System Menu 1.)
Irregular display	Low sensitivity	Increase the Gain by turning the GAIN control clockwise.
	Low reflectivity from seabed	Suspect muddy seabed.
	Marine life on transducer	Remove marine life from the transducer when dry docked.
Loss of seabed display	Out of range	Check the range scale setting.
	Air bubbles caused by going astern or running over other ship wakes	This is normal, it is not a sign of equipment trouble.
Heavy noise	Wrong installation place of transducer	Find cause of noise. Relocate the transducer if noise persists.
	Other echo sounders nearby	If more than one echo sounder is working on the ship, there is no ideal measure to cure the Problem.
Surface noise	Aeration in near surface area	Not an equipment problem.
	Rough weather	Not an equipment problem.

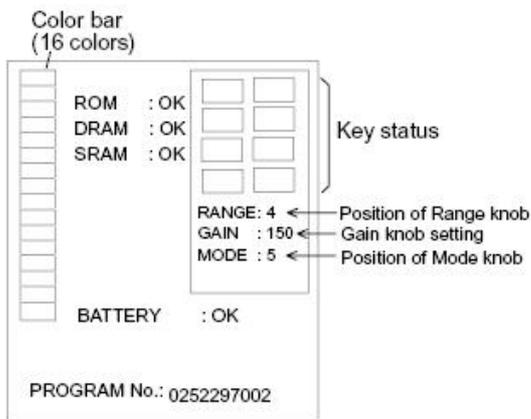
5.6 Diagnostic Test

The diagnostic test checks the ROM, RAM, color bar and keyboard for proper operation.

1. Turn on the power while pressing any key. Release the keys when the following display appears.



2. Press the [-] key.



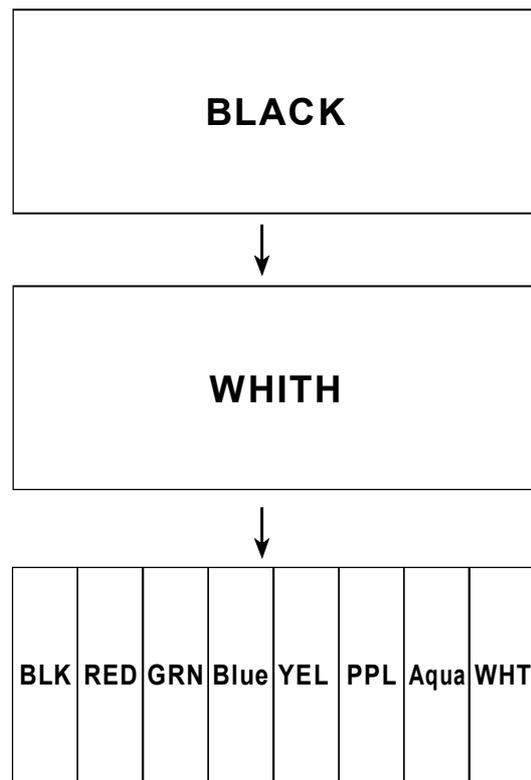
3. The ROM, DRAM, SRAM and internal battery are checked and the results are displayed as OK or NG (No Good). If NG appears, contact your dealer for advice.
4. Press and release each key (except the POWER switch) one by one. If the key is normal, its on-screen location lights in black while the key is pressed.

5. Operate the controls. The RANGE and MODE control setting indications should be the same as actual control settings. The GAIN control setting indication should be between 0 and more than 230.
6. Press the POWER SWITCH to finish. Turn on the power again to resume operation.

5.7 Test Pattern

The test pattern is used to check color performance.

1. Turn on the POWER SWITCH while pressing any key.
2. Press the BRILL key three times. Press the BRILL key again to change the test pattern as below.



3. Press the BRILL key again to return to the EXTENSION MODE menu.

5.8 Clearing the Memory

All menu settings can be cleared to start afresh. All default menu settings are restored when the memory is cleared. For your reference all default settings are shown in the menu tree at the end of this manual.

1. Turn on the power while pressing any key. Release the keys when the EXTENSION MODE menu appears.
2. Press the [▲] key. The following window appears.



3. Press the [+] key to clear the memory. The following window appears.



Then the following display appears after the memory is cleared.



4. After data is cleared, the EXTENSION MODE menu appears.

Note: The setting for the items LANGUAGE and TRANSDUCER in the system menu is not disturbed when the memory is cleared.

6 DIGITAL INTERFACE

1. I/O Sentences

Input sentences of channel 1 (NAV IN)

RMA, RMC, GLL, GGA, VTG, ZDA

Output sentences of channel 2 (NAV OUT)

DBT, DPT, DBS (NMEA 0183)

Transmission interval

1 s for any sentence

Data transmission

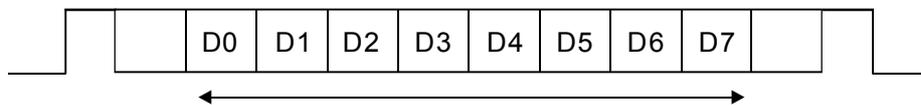
Data is transmitted in serial asynchronous form in accordance with the standard referenced in 2.1 of IEC 61162-1. The first bit is a start bit and is followed by data bits, least-significant-bit as illustrated below.

The following parameters are used:

Baud rate: 4800

Data bits: 8 (D7 = 0), parity none

Stop bits: 1



3. Sentence Description

DPT - Depth

\$--DPT,x.x,x.x,x.x*hh<CR><LF>

||||

||| +----- 4

|| +----- 3

| +----- 2

+----- 1

1. Water depth relative to transducer, in meters
2. Offset from transducer, in meters(see notes 1 and 2)
3. Maximum range scale in use
4. Checksum

NOTE1 "positive"=distance from transducer to water-line.

"-"=distance from transducer to keel.

NOTE2 For IEC applications the offset should always be applied so as to provide depth relative to the keel.

DBS - Depth below surface

\$--DBS,x.x,f,x.x,M,x.x,F*hh<CR><LF>

||||||

||||| +----- 4

||| +--+----- 3

|| +--+----- 2

+--+----- 1

1. Water depth, feet
2. Water depth, m
3. Water depth, fathoms
4. Checksum

