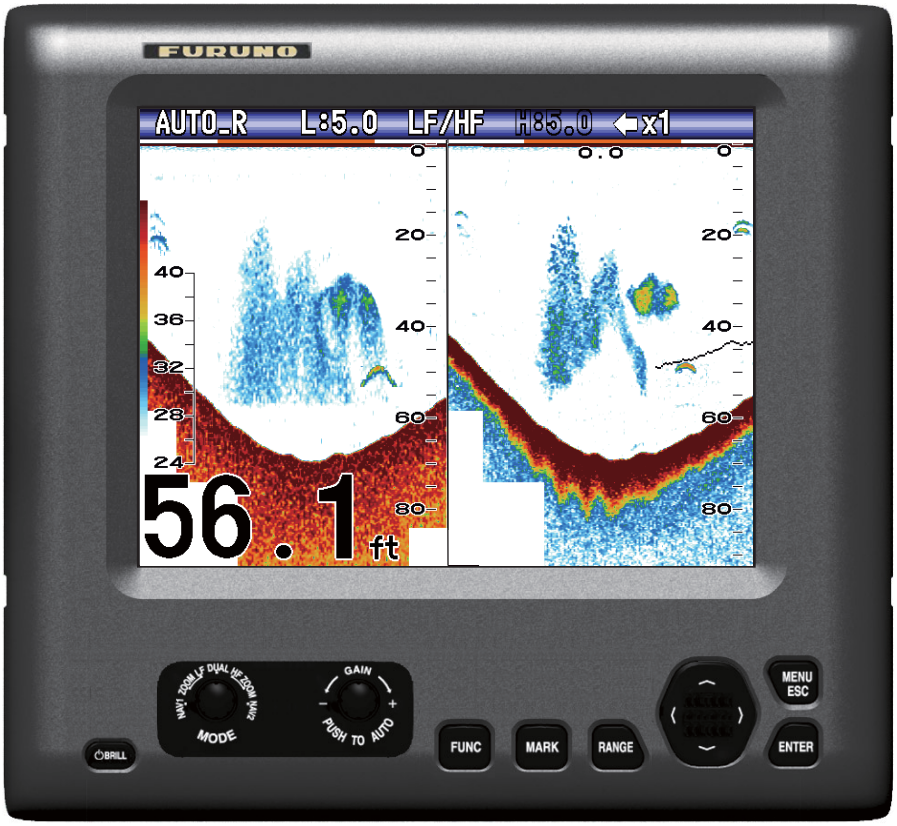
FURUNO

OPERATOR'S MANUAL

Color LCD Fish Finder

FCV-288



FURUNO ELECTRIC CO., LTD.

www.furuno.com

(Elemental Chlorine Free)

The paper used in this manual
is elemental chlorine free.

FURUNO ELECTRIC CO., LTD.

9-52 Ashihara-cho,
Nishinomiya, 662-8580, JAPAN

・FURUNO Authorized Distributor/Dealer

 Printed in Japan

A : APR. 2012
F : SEP. 14, 2016

Pub. No. OME-23830-F

(TASU) FCV-288

0001765791 5

IMPORTANT NOTICES

General

- This manual has been authored with simplified grammar, to meet the needs of international users.
- The operator of this equipment must read and follow the descriptions in this manual. Wrong operation or maintenance can cancel the warranty or cause injury.
- Do not copy any part of this manual without written permission from FURUNO.
- If this manual is lost or worn, contact your dealer about replacement.
- The contents of this manual and equipment specifications can change without notice.
- The example screens (or illustrations) shown in this manual can be different from the screens you see on your display. The screens you see depend on your system configuration and equipment settings.
- Save this manual for future reference.
- Any modification of the equipment (including software) by persons not authorized by FURUNO will cancel the warranty.
- The following concern acts as our importer in Europe, as defined in DECISION No 768/2008/EC.
  - Name: FURUNO EUROPE B.V.
  - Address: Ridderhaven 19B, 2984 BT Ridderkerk, The Netherlands
- All brand and product names are trademarks, registered trademarks or service marks of their respective holders.

How to discard this product

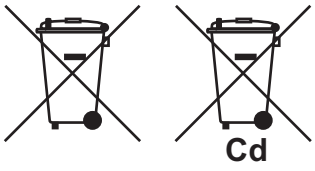
Discard this product according to local regulations for the disposal of industrial waste. For disposal in the USA, see the homepage of the Electronics Industries Alliance (http://www.eiae.org/) for the correct method of disposal.

How to discard a used battery

Some FURUNO products have a battery(ies). To see if your product has a battery, see the chapter on Maintenance. Follow the instructions below if a battery is used. Tape the + and - terminals of battery before disposal to prevent fire, heat generation caused by short circuit.

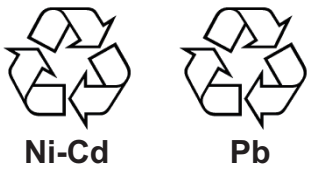
In the European Union

The crossed-out trash can symbol indicates that all types of batteries must not be discarded in standard trash, or at a trash site. Take the used batteries to a battery collection site according to your national legislation and the Batteries Directive 2006/66/EU.



In the USA

The Mobius loop symbol (three chasing arrows) indicates that Ni-Cd and lead-acid rechargeable batteries must be recycled. Take the used batteries to a battery collection site according to local laws.



In the other countries

There are no international standards for the battery recycle symbol. The number of symbols can increase when the other countries make their own recycle symbols in the future.

SAFETY INSTRUCTIONS

The operator and installer must read the applicable safety instructions before attempting to operate or install the equipment.

WARNING	Indicates a condition that can cause death or serious injury if not avoided.
CAUTION	Indicates a condition that can cause minor or moderate injury if not avoided.

Warning, Caution Prohibitive Action Mandatory Action

Safety Instructions for the Operator

WARNING

ELECTRICAL SHOCK HAZARD
Do not open the equipment.

Hazardous voltage exists inside the equipment. Refer repair to authorized service personnel.

Immediately turn off the power at the switchboard if the equipment is emitting smoke or fire.

Continued use of the equipment can cause fire or electrical shock. Contact a FURUNO agent for service.

Do not maneuver the vessel based on the depth indication alone.

Grounding can result.

Do not disassemble or modify the equipment.

Fire, electrical shock or injury can result.

Use the proper fuse.

Use of an incorrect fuse can damage the equipment and can cause fire.

CAUTION

Do not turn on the equipment with the transducer out of water.

The transducer can be damaged.

The picture is not refreshed when picture advancement is stopped.

Maneuvering the vessel in this condition can result in a dangerous situation.

Adjust the gain correctly.

Incorrect gain may give a wrong depth indication, which could result in a dangerous situation.

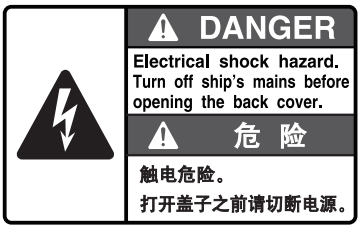
The data presented by this equipment is intended as a source of navigation information.

The prudent navigator never relies exclusively on any one source of navigation information, for safety of vessel and crew.

Warning Label

Name: Warning Label
Type: 02-166-1123-0

A warning label and a danger label are attached to the equipment. Do not remove these labels. If the labels are missing or damaged, contact a FURUNO agent or dealer about replacement.



Name: Danger Label HV
Type: 02-166-1124-1

Name: Danger Label
Type: 02-166-1126-1

Safety Instructions for the Installer

⚠ WARNING

Turn off the power at the switchboard before beginning the installation.

Fire or electrical shock can result if the power is left on.

Be sure no water leaks in at the transducer or sensor mounting location.

Water leakage can sink the vessel. Also confirm that the transducer and/or sensor will not loosen by ship's vibration. The installer is solely responsible for the proper installation of the equipment. FURUNO will assume no responsibility for any damage associated with improper installation of the transducer.

Use the specified power cable.

Use of other power cable can cause fire.

⚠ CAUTION

Do not install the transducer or sensor where air bubbles and noise are present.

Performance will be affected.

The following are guidelines for handling of the transducer cable.

- **Keep fuels and oils away from the cable.**
- **Locate cable in a safe place.**
- **Do not paint the cable.**

The sheath of the cable is made of chloroprene rubber (or polychloride vinyl). For this reason do not paint the cable.

Do not turn on the equipment with the transducer out of water.

The transducer can be damaged.

Observe the following compass safe distances to prevent interference to a magnetic compass:

Display unit	Standard compass	Steering compass
FCV-288	0.95 m	0.60 m

TABLE OF CONTENTS

FOREWORD

A Word to FCV-288 Owners

Congratulations on your choice of the FURUNO FCV-288 Fish Finder. We are confident you will see why the FURUNO name has become synonymous with quality and reliability.

Since 1948, FURUNO Electric Company has enjoyed an enviable reputation for innovative and dependable marine electronics equipment. This dedication to excellence is furthered by our extensive

This equipment is designed and constructed to meet the rigorous demands of the marine environment. However, no machine can perform its intended function unless operated and maintained properly. Please carefully read and follow the recommended procedures for operation and maintenance.

We would appreciate hearing from you, the end user, about whether we are achieving our purposes.

Thank you for considering and purchasing FURUNO equipment.

Features

The FURUNO FCV-288 is a dual frequency (50 kHz and 200 kHz) Fish Finder. Comprised of a display unit and a transducer, the FCV-288 displays underwater conditions on a 10.4-inch color LCD in various colors according to echo strength.

The main features of the FCV-288 are:

- Automatic mode automatically adjusts the set to provide the best possible display, from shallow to deep depths.
- White line feature helps distinguish bottom fish from the bottom echo.
- Gain adjusts sensitivity over the entire screen.
- Various alarms alert you to presence of fish, dangerous situations, etc.
- Echo position can be output to a navigational plotter.*

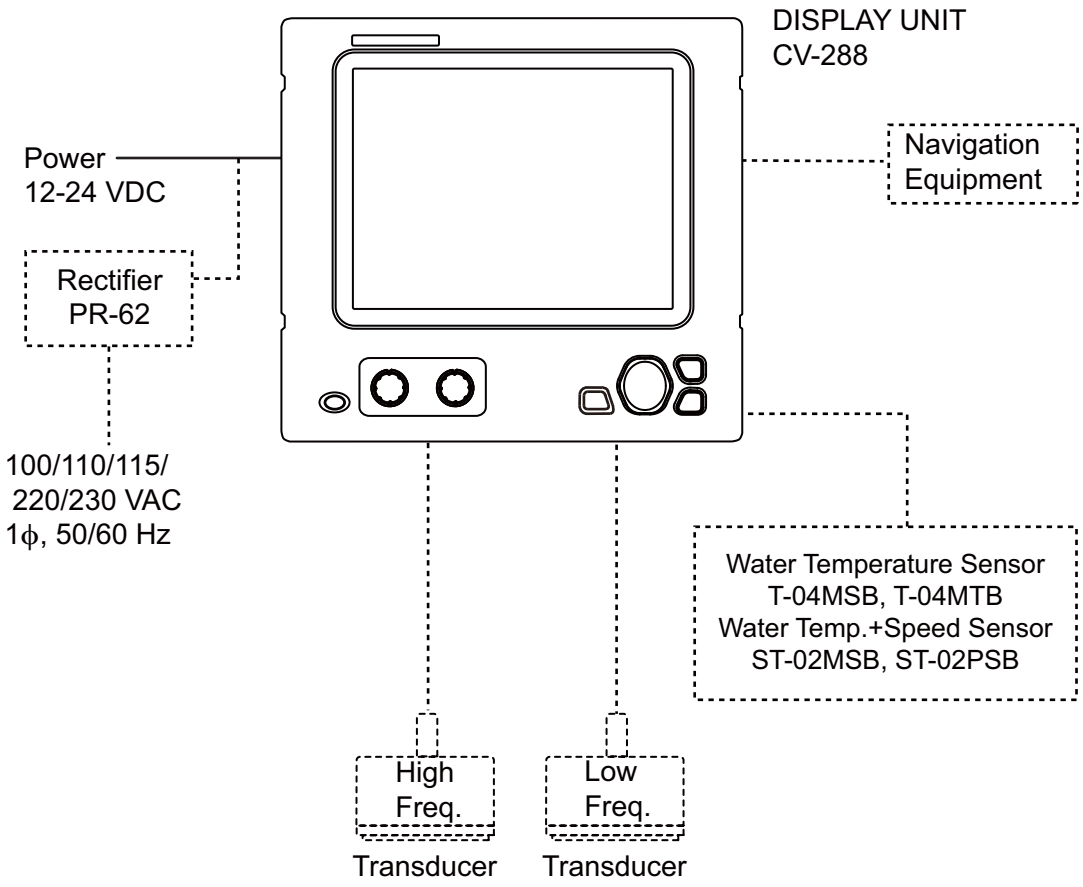
*: Requires connection of appropriate navigation device.

TFT LCD

The TFT LCD is constructed using the latest LCD techniques, and displays 99.99% of its pixels. The remaining 0.01% of the pixels may drop out or blink, however this is not an indication of malfunction; it is an inherent property of the LCD.

SYSTEM CONFIGURATION

Standard configuration is shown below with solid line.



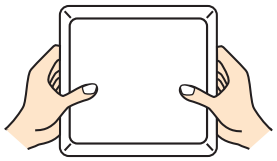
1. OPERATION

1.1 Control Description

No.	Control	Function
1	⏻ BRILL	**Short press:** Turns on power; opens the [Brill] adjustment window. **Long press:** Turns off power.
2	MODE	Selects display mode.
3	GAIN	**Push:** Opens [Auto Gain] setting window. **Rotate:** Manually adjusts gain.
4	FUNC	**Short press:** Opens window programmed. **Long press:** Opens function key programming window.
5	MARK	Outputs the position data.
6	RANGE	Opens range selection window.
7	▲▼◀▶ (TrackPad)	• Selects items on the menu. • Changes settings. • Moves VRM (Variable Range Marker) by using ▲ or ▼ except for nav mode.
8	MENU ESC	• Opens menu. Goes back one page in multi-page menu. • Escapes from current operation.
9	ENTER	Saves settings.

How to remove the cover (Option)

While pressing the center of the cover with your thumbs as illustrated, pull the cover toward you.



1.2 Power On/Off

1. Press the ⏻ **BRILL** key to turn on the power. The unit beeps then the startup screen appears.

Start-up screen

2. To turn off the power, press the ⏻ **BRILL** key more than three seconds. The time remaining until the power goes off is counted down on the screen.

1.3 Display Brilliance

1. Press the ⏻ **BRILL** key momentarily to show the [Brill] adjustment window.

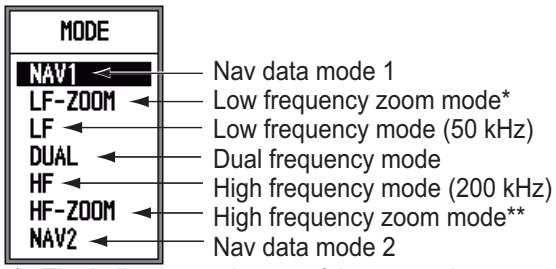
2. Press the ⏻ **BRILL** key. Continual pressing changes the brilliance continuously (0→1→…9→8→…→0→1→…). "0" is the dimmest and "9" is the brightest. You can also adjust the brilliance with ◀ or ▶.
3. Press the **ENTER** key or **MENU ESC** key to save the setting and close the window. (The window automatically closes if there is no key operation for approx. six seconds.)

Note: Key panel brilliance cannot be adjusted manually; its brilliance is changed automatically with display brilliance, as shown below.

- Max. brilliance: Min. panel brilliance
- Min. brilliance: Max. panel brilliance

1.4 Display Mode

1. Rotate the **MODE** knob to open the mode setting window, which is displayed for six seconds.



*: The indication at the top of the screen is BL-LF, BZ-LF or MZ-LF.
**: The indication at the top of the screen is BL-HF, BZ-HF or MZ-HF.

BL: Bottom lock, LF: Low frequency,
BZ: Bottom zoom, HF: High frequency,
MZ: Marker zoom

2. Rotate the **MODE** knob again to select the display mode desired. The screen related to the mode you selected appears.

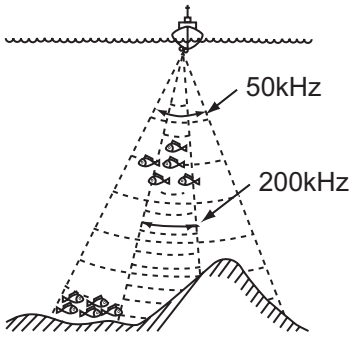
1.4.1 Single frequency display

Low frequency (50 kHz)

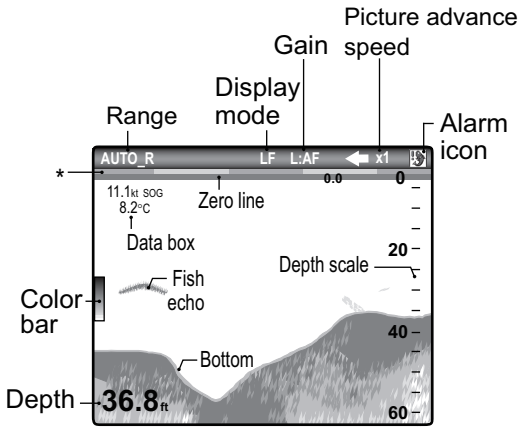
The sounder uses ultrasound pulse signals to detect bottom conditions. The lower the frequency of the signal, the wider the detection area. Therefore, the 50 kHz is useful for general detection and judging bottom condition.

High frequency (200 kHz)

The higher the frequency of the ultrasound pulse signal, the better the resolution. For this reason the 200 kHz is ideal for detailed observation of schools of fish.



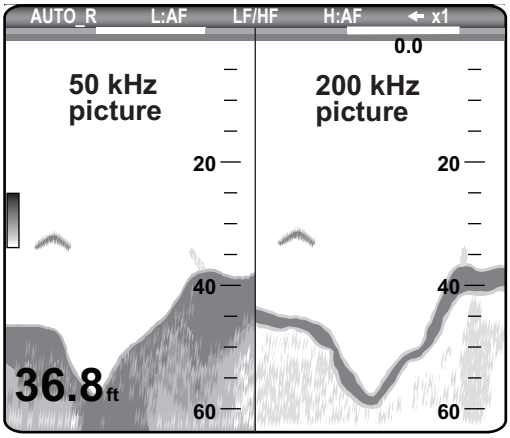
Beam width



*Minute marker (two different color bars in 1 min.)

1.4.2 Dual frequency display

The 50 kHz picture appears on the left; the 200 kHz picture on the right. This display is useful for comparing the same picture with two different frequencies.



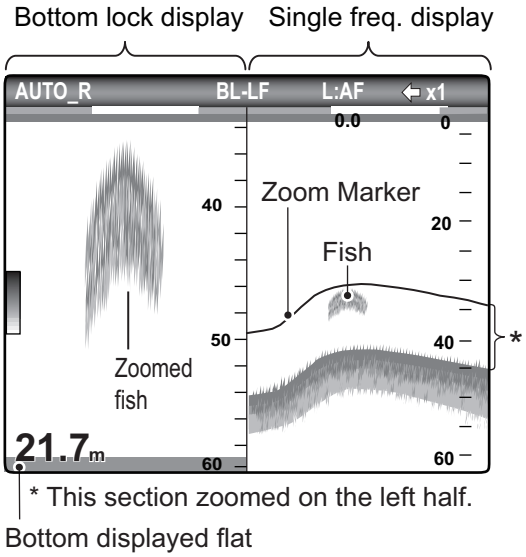
Freq. (kHz)	Beamwidth	Resolution	Detection range	Bottom tail
50	Wide	Low	Deep	Long
200	Narrow	High	Shallow	Short

1.4.3 Zoom displays

Zoom mode expands chosen area of the single frequency picture. Three modes are available: bottom lock, bottom zoom and marker zoom. The default zoom mode is bottom lock.

Bottom lock display

The bottom lock display provides a normal picture on the right half of the screen and a 16-600 feet (default: 30 feet) wide layer in contact with the bottom is expanded onto the left half of the screen. This mode is useful for detecting bottom fish.

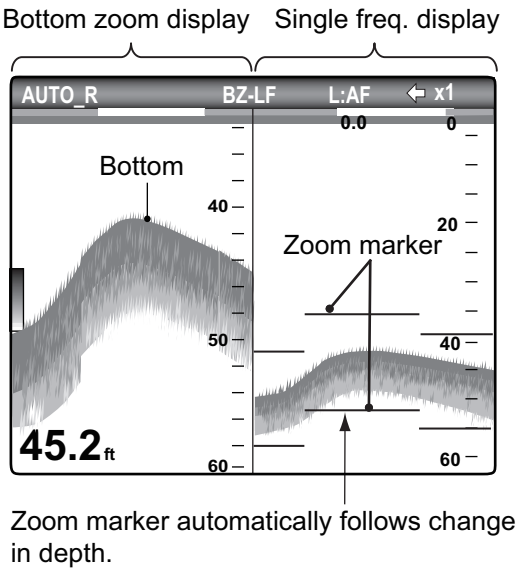


Note 1: To adjust the range of the zoom display, go to the [Range] menu (see section 2.2).

Note 2: To show or hide the zoom marker, go to the [Display] menu.

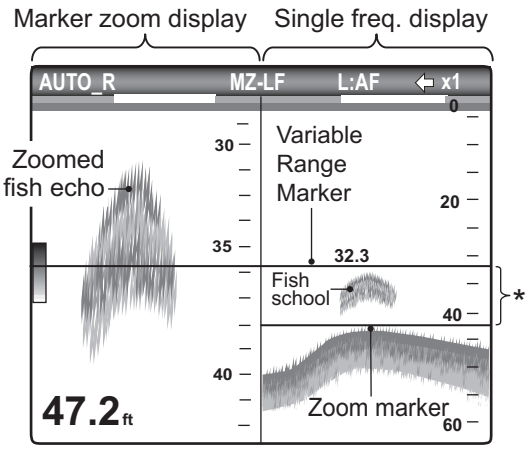
Bottom zoom display

The bottom zoom mode expands bottom and bottom fish on the left-half window. This mode is useful for tracking bottom contour. When the bottom depth increases (or decreases), the display automatically shifts to keep the bottom echo at the lower part of the screen.



Marker zoom display

The marker zoom mode expands the chosen area of the normal picture to full vertical size of the screen on the left-half window. You may specify the portion to expand by operating the VRM (Variable Range Marker), which you can shift with ▲ or ▼. The area between the VRM and zoom marker is expanded. This mode is useful for determining the size of fish in the middle water.



* This area zoomed on left half of screen.

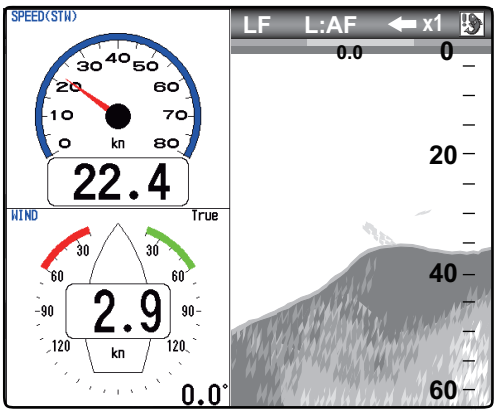
1.4.4 Nav data display

The nav data displays appear on the left 2/5 of the screen. Data other than depth requires appropriate sensor.

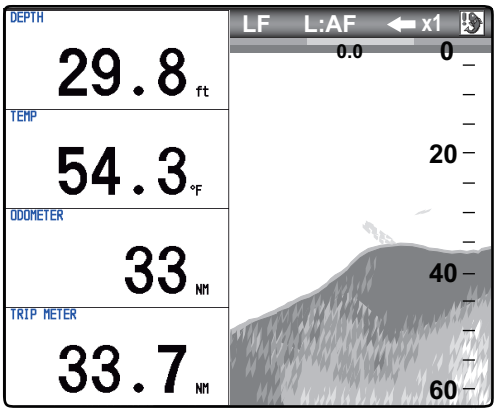
Two nav data displays are available, Nav Data 1 or Nav Data 2, and you may select the combination of data on the [Display] menu. The default settings are as follows.

NAV1: Two-data display (SPEED (STW), WIND)
NAV2: Four-data display (DEPTH, TEMPERATURE, TRIP METER, ODOMETER)

You can display between two and four items in a nav data display and select the item and order to display them. For details, see section 1.18.



NAV1 display



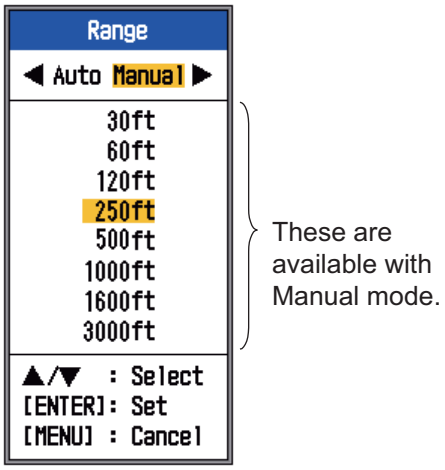
NAV2 display

NAV1, NAV2 displays

1.5 How to Select a Range

The basic range may be selected in the [Auto] or [Manual] mode.

1. Press the **RANGE** key to open the [Range] setting window.



2. Use ◀ or ▶ to select [Auto] or [Manual].
   [Auto]: The range changes automatically to display the bottom echo on the screen always. (The shift function is inoperative in the auto mode.) [AUTO_R] is shown at the top left corner on the screen.
   [Manual]: The range may be selected from the eight ranges listed below. [MAN_R] is shown at the top left corner on the screen.
   If you selected [Auto], go to step 4. For [Manual], go to the next step.
3. For [Manual], use the **RANGE** key (or ▲ or ▼) to select the range.

Unit	Basic Range							
	1	2	3	4	5	6	7	8
m	10	20	40	80	150	300	500	1000
ft	30	60	120	250	500	1000	1600	3000
fm	5	10	20	40	80	160	250	500

Note: Basic ranges may be preset as desired. For further details, see section 2.2.

4. Press the **ENTER** key.

Note: The range mode indication, which appears at the top-left corner, may be turned on or off with [Header Info] in the [Display] menu. For details, see [Header Info] on page 16.

1.6 How to Adjust the Gain

How to select the gain adjustment mode

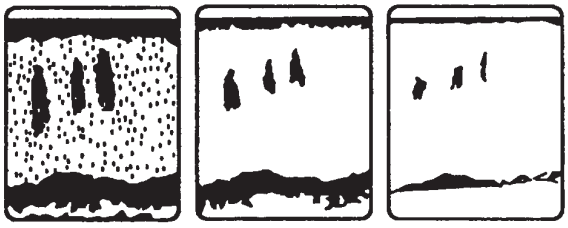
The gain may be adjusted automatically ([Fishing] or [Cruising]) or manually. In automatic adjustment, the gain is automatically selected to display the bottom echo in reddish brown. The automatic gain setting can be fine tuned with the offset gain feature. Clutter and TVG are also adjusted automatically when automatic gain is active.

For manual gain adjustment, adjust the gain according to signal strength.

⚠ CAUTION

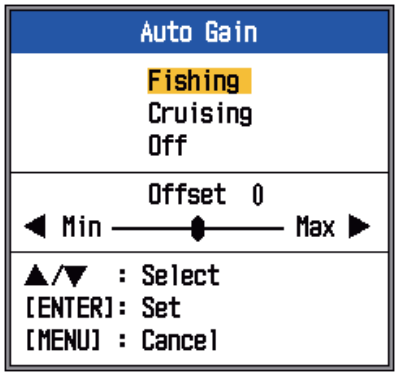
Adjust the gain correctly.

Incorrect adjustment can lead to a dangerous situation if the boat is steered according to the depth indication.



Too high Correct Too low

1. Press the **GAIN** knob to open the [Auto Gain] setting window.



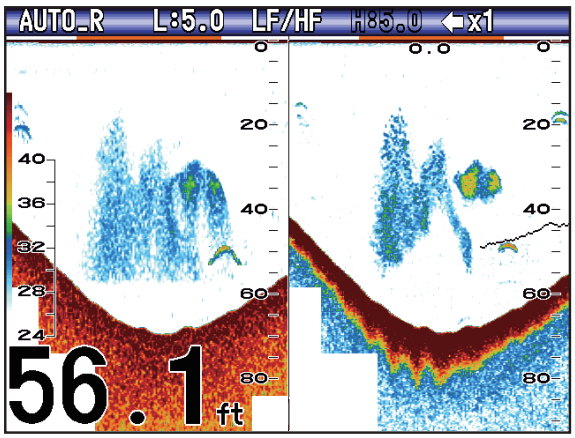
2. Press the **GAIN** knob (or ▲ or ▼) again to select [Fishing], [Cruising] or [Off].
   [Fishing]: This mode clearly displays weaker echoes and is useful for searching schools of fish. "G:AF" is shown at the top left corner on the screen.

[Cruising]: This mode clearly displays stronger echoes (for example, bottom) and suppresses weak echoes. Use this mode for general cruising. "G:AC" is shown at the top left corner on the screen.
[Off]: For manual gain adjustment. The display shows, "G:X.X" (X.X=gain setting) when manual gain is active.
If you selected [Fishing] or [Cruising], you can apply an offset to the gain, at step 3. To apply no offset, go to step 4. For [Off], do steps 4 and 5.

3. Press ◀ or ▶ (setting range: -5 to +5) to apply an offset. Press ◀ to decrease the offset; ▶ to raise the offset.
4. Press the **ENTER** key. The new gain setting is also applied to past echoes.
5. For manual adjustment, rotate the GAIN control to set the gain (0.0 to 10).

Individual Gain Setting

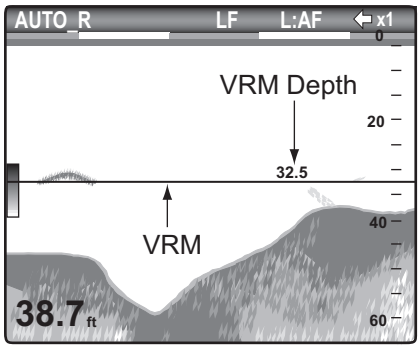
The gain of the low and high frequencies can be set individually on the dual frequency display (paragraph 1.4.2). Turn off [Auto Gain] (section 1.6) to enable this function. Press ◀ to select the LF or ▶ to select HF, then adjust the Gain control. The setting range for either frequency is 0.0 to 10.



1.7 How to Measure Depth

The VRM (Variable Range Marker) functions to measure the depth to schools of fish, etc. This function is inoperative when a NAV data display is active.

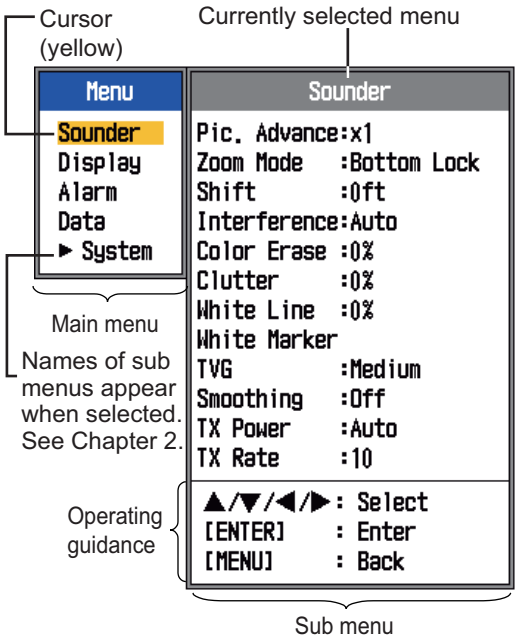
1. Use ▲ or ▼ to place the VRM on the object to measure depth.
2. Read the VRM depth just above the VRM.



1.8 Menu Operating Procedure

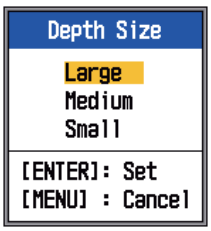
Your fish finder has five main menus: Sounder, Display, Alarm, Data, and System. Below is the basic menu operating procedure.

1. Press the **MENU ESC** key to open the menu.



2. Use ▲ or ▼ to select the main menu desired. The cursor (yellow) highlights current selection. The items in the sub menu change with the menu selected.
3. Press the **ENTER** key (or ▶). The cursor (yellow) shifts to the sub menu and the current selection on the main menu window (left) is highlighted in gray.
4. Use ▲ or ▼ to select the menu item desired and press the **ENTER** key. A setting box or window appears depending on menu item. The example below shows the setting options and setting window for [Depth Size].

Setting options



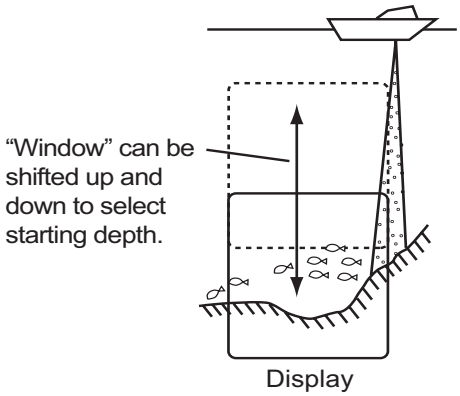
Setting window

5. Use ▲ or ▼ to select an option or change a value.
6. Press the **ENTER** key (or ◀) to save the setting. The setting box or window disappears. To escape without changing a setting, press the **MENU ESC** key instead of the **ENTER** key.
7. To select another menu, press the **MENU ESC** key (or ◀). The cursor (yellow) moves to the main menu.
8. Press the **MENU ESC** key to close the menu.

Note: Hereafter, this manual replaces the instruction “use ▲ or ▼ to (select an item or change a value)”, with “select”.

1.9 How to Shift the Range

The basic range and range shift together give you the means to select the depth you can see on the screen. The basic range can be thought of as providing a “window” into the water column and range shifting as moving the “window” to the desired depth.

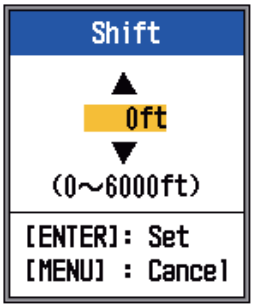


Display

Note: This function is inoperative when [AUTO_R] (auto range mode indication) is displayed.

The basic range can be shifted up or down in the [Manual] mode as follows:

1. Open the menu, select the [Sounder] menu and press the **ENTER** key.
2. Select [Shift] and press the **ENTER** key.



3. Set the amount of shift desired and press the **ENTER** key. The step for the amount of shift depends on setting range on the [Range] sub menu in the [System] menu. Below are the steps for feet and meters.

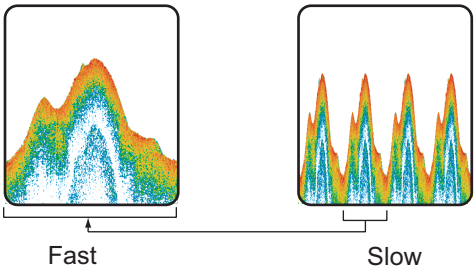
Unit: feet	**Unit: meter**	**Unit: fathom**	
Range	Range	Range	Step
-	5	2 - 30	1
-	6 - 10	-	2
16 - 20	11 - 20	-	5
21 - 50	21 - 50	30 - 500	10
60 - 100	60 - 100	-	20
110 - 250	110 - 250	500 - 1000	50
260 - 500	260 - 500	1000 - 1500	100
550 - 1000	550 - 1000	-	200
1100 - 9000	1100 - 3000	-	500

4. Press the **MENU ESC** key twice to close the window.

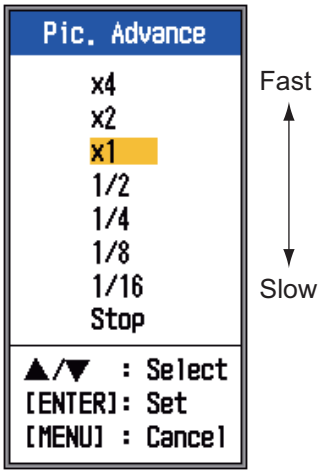
Note: Echoes may be lost if the amount of shift is greater than actual depth.

1.10 Picture Advance Speed

The picture advance speed determines how quickly the vertical scan lines run across the screen. When selecting a picture advance speed, keep in mind that a fast advance speed will expand the size of a school of fish horizontally on the screen and a slow advance speed will contract the school. Use a fast advance speed to observe a rugged bottom, and use a slow advance speed to monitor a smooth bottom.



1. Open the menu, select [Sounder] and press the **ENTER** key.
2. Select [Pic. Advance] and press the **ENTER** key.



3. Select picture advance speed desired and press the **ENTER** key. [1/16] is the slowest speed and [x4] is the fastest speed. The fractions denote the number of scan lines produced per transmission. For example, [1/16] means one scan line is produced every 16 transmissions. [Stop] stops picture advancement and is useful for taking a screenshot. Current picture advance speed is displayed at the top-right corner of the screen.

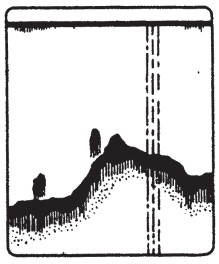
> **⚠ CAUTION**
>
> **The picture is not refreshed when picture advancement is stopped.**
>
> Maneuvering the vessel in this condition may result in a dangerous situation.

4. Press the **MENU ESC** key twice to close the window.

1.11 How to Reduce-Interference

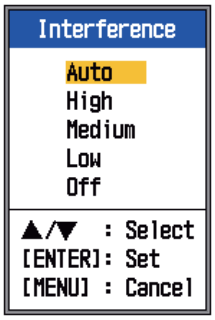
Interference from other acoustic equipment operating nearby or other electronic equipment on your boat may show itself on the display as shown in the figure below. Follow the procedure below to reduce interference.

Interference from other sounder



Electrical interference

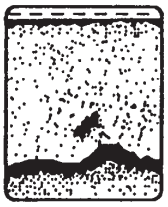
1. Open the menu, select [Sounder] and press the **ENTER** key.
2. Select [Interference] and press the **ENTER** key.



3. Select the degree of interference reduction desired and press the **ENTER** key.
   [Auto]: Interference is suppressed automatically.
   [High], [Medium], [Low]: [High] provides the greatest degree of interference reduction and [Low] is the smallest.
   [Off]: Turn off the interference rejector.
   Note: Turn off the interference rejector when no interference exists, so as not to miss weak echoes from small targets.
4. Press the **MENU ESC** key twice to close the window.

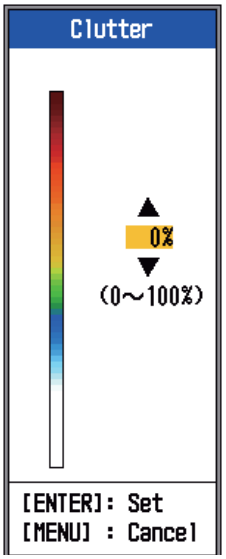
1.12 How to Reduce Low Level Noise

Low intensity “speckles”, caused by sediments in the water or noise, may appear over most of screen. These speckles can be suppressed by adjusting the [Clutter].



Note: [Clutter] cannot be adjusted when [Fishing] or [Cruising] is selected (on the [Auto Gain] setting window).

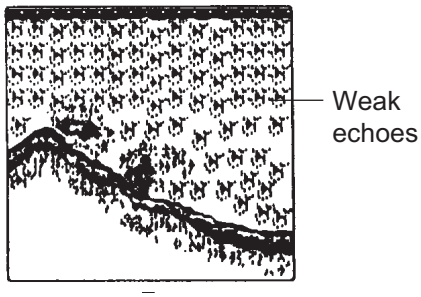
1. Open the menu, select [Sounder] and press the **ENTER** key.
2. Select [Clutter] and press the **ENTER** key.



3. Select the degree of clutter reduction desired and press the **ENTER** key. The setting range is 0% to 100% in intervals of ten per cent. The larger the setting value, the greater the degree of reduction.
4. Press the **MENU ESC** key twice to close the window.

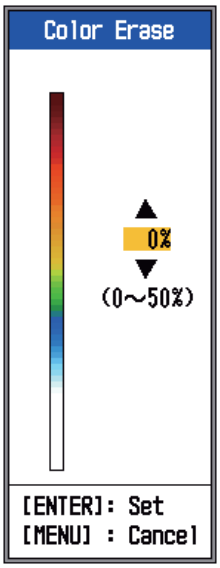
1.13 How to Erase Weak Echoes

Sediment in the water or reflections from plankton may be painted on the display in low intensity tones.



These weak echoes may be erased by using the [Color Erase] feature. This feature erases weaker echoes sequentially to show only strong echoes and clear the picture.

1. Open the menu, select [Sounder] and press the **ENTER** key.
2. Select [Color Erase] and press the **ENTER** key.



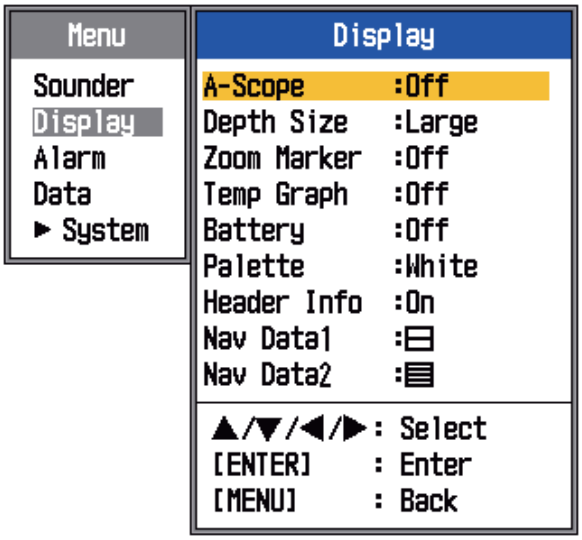
3. Select the color to erase and press the **ENTER** key. The setting range is 0 to 50% in intervals of one per cent. The larger the setting value, the greater the number of colors that are erased.
4. Press the **MENU ESC** key twice to close the window.

1.14 A-scope Display

The A-scope display shows echoes at each transmission with amplitudes and tone proportional to their intensities, on the right 1/5 of the screen. The display shows strong echoes with strong amplitude; weak echoes in weak amplitude. Thus the A-scope display is useful for estimating the kind of school of fish and bottom composition.

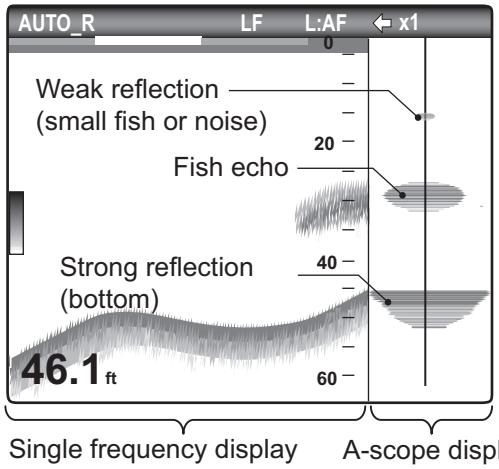
Note: The A-scope display is only available with the high frequency display in dual frequency operation.

1. Open the menu, select [Display] and press the **ENTER** key.



2. Select [A-Scope] and press the **ENTER** key.
3. Select [Off] or [On] and press the **ENTER** key.

4. Press the **MENU ESC** key twice to close the window.



1.15 Alarms

This fish finder has four fish alarms. When the conditions of an alarm are met, the audio alarm sounds and the alarm icon (flashing) appears at the top right corner on the display. The audio alarm may be silenced by pressing any key. The alarm icon remains on the screen until the cause of the alarm is removed or the offending alarm is disabled.

Alarm icon* (flashing)

* Appears when alarm condition is met.

: Multiple alarm

Description of alarms

- Fish alarms

The **fish school alarm** alerts you to a school of fish in the set alarm zone.

The **bottom fish alarm** is given when a fish is within the specified distance from the bottom. Available when the bottom lock display is active.

The **water temperature alarm*** alerts you when the water temperature is within (inside alarm) the alarm range set or under/over (outside alarm) the range set.

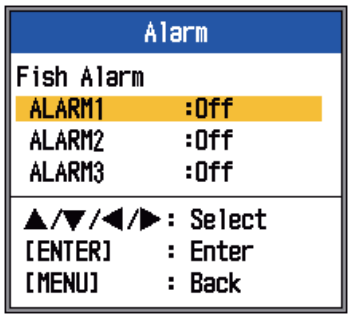
The **bottom alarm** alerts you when the bottom echo (displayed in red or reddish brown) is within the alarm range set.

* Requires applicable sensor.

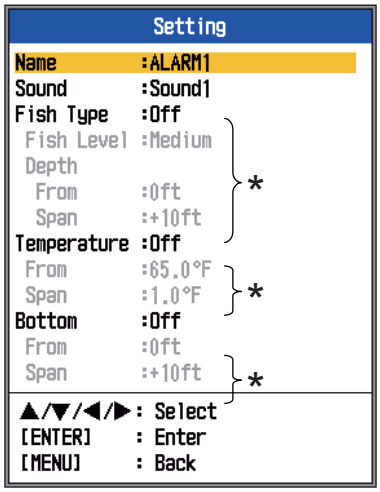
How to activate a fish alarm

Multiple fish alarms (ALARM1 - ALARM3, default names) can be activated. In this case, the audio and visual alarms are released when all alarm conditions are met. For example, when the Bottom alarm is set for 10-20 feet and the Temperature alarm is set for [Inside] and 65°F with a span of 1.0°F. The system judges if the depth to the bottom is 10-20 feet and water temperature is within the range of 65-66°F. If the depth to the bottom and water temperature is within the range set, the audio and visual alarms are released. The alarms are not released if only one condition is met.

1. Open the menu, select [Alarm] and press the **ENTER** key.



2. Select an alarm among [ALARM1] - [ALARM3] (default alarm names) and press the **ENTER** key.
3. Select [Setting] and press the **ENTER** key. If you want to change the name of an alarm, go to step 4. Otherwise go to step 6.



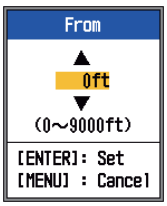
* Operable when corresponding alarm is activated.

4. To change the name of the alarm, select [Name] and press the **ENTER** key.

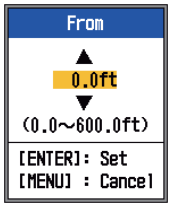
5. Enter the name of the alarm. (Max. of eight characters)
   1) Use ▲ or ▼ to select a character. Use ▲ to select a character in numerical order followed by alphabet order. Use ▼ to select a character in reverse order of that with ▲.
   2) Press ▶ to move the cursor to the next place.
   3) Repeat steps 1) and 2) to complete the name.
   4) Press the **ENTER** key to finish.
6. Select [Sound] and press the **ENTER** key.
7. Select desired alarm sound and press the **ENTER** key.
8. Select [Fish Type], [Temperature] or [Bottom] as applicable and press the **ENTER** key.
9. Do one of the following according to the item selected at step 8.

   Fish Type
   1) Select [Fish School] or [Bottom Fish (Only BL)] and press the **ENTER** key.
   2) Select [Fish Level] and press the **ENTER** key.
   3) Select the echo strength that triggers the alarm, referring to the information below.
      [Weak]: Echoes stronger than light-blue trigger the alarm.
      [Medium]: Echoes stronger than yellow trigger the alarm.
      [Strong]: Echoes stronger than red trigger the alarm.

4) Select the [From] that is below [Depth] and press the **ENTER** key.

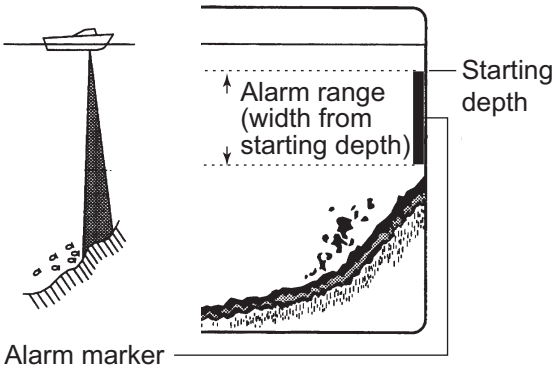


Fish School alarm



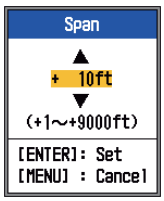
Bottom Fish alarm

5) Enter the width of the alarm and press the **ENTER** key.
The alarm marker appears at the starting point for the alarm. (The marker appears only when the corresponding alarm is active.) The starting depth for the Fish School alarms is the transducer position. For the Bottom Lock alarm the starting depth is the distance from the bottom.

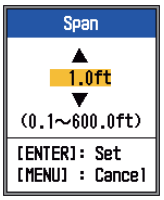


- Fish School, Bottom: Right side
- Bottom lock: Center

6) Select [Span] and press the **ENTER** key.



Fish School alarms

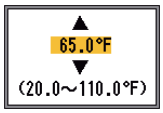


Bottom Fish alarm

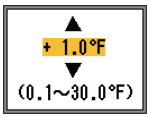
7) Enter the alarm width and press the **ENTER** key.

Water temperature

1) Select [Inside] or [Outside] as applicable and press the **ENTER** key.
2) Select [From] and press the **ENTER** key.



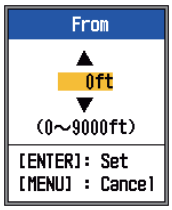
3) Enter the starting temperature for the alarm and press the **ENTER** key.
4) Select [Span] and press the **ENTER** key.



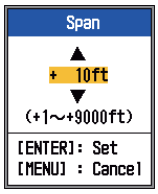
5) Enter the width for the alarm and press the **ENTER** key.

Bottom

1) Set [Bottom] to [On] and press the **ENTER** key.
2) Select [From] and press the **ENTER** key.



3) Set the starting depth and press the **ENTER** key.
4) Select [Span] and press the **ENTER** key.
5) Set the width of the alarm and press the **ENTER** key.



10. Press the **MENU ESC** key to show the [Fish Alarm] setting window.
11. Select [Alarm] and press the **ENTER** key.
12. Select [On] and press the **ENTER** key.

Note 1: To disable an alarm, select [Off] at step 12 in the above procedure.

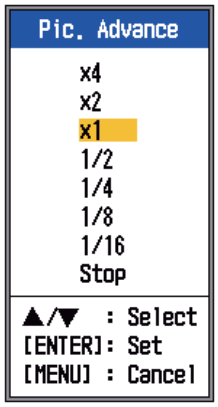
Note 2: The default alarm settings can be restored. Open the [Fish Alarm] setting window, select [Reset?], press the **ENTER** key, select [Yes] and press the **ENTER** key.

1.16 FUNC Key

The **FUNC** key provides for one-touch call up of desired function setting window. 8 items are available: picture advance, shift, interference, clutter, color erase, white line, white marker, and TVG.

1.16.1 How to use the FUNC key

1. Short-press the **FUNC** key to open the setting window programmed; for example, the [Pic. Advance] setting window.

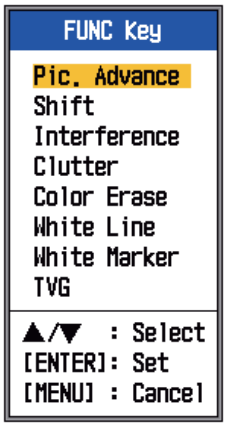


[Pic. Advance] setting window

2. Use the FUNC key, ▲ or ▼ to select a setting and press the **ENTER** key.

1.16.2 How to change the function

1. Press and hold down the **FUNC** key to show the [FUNC Key] menu.

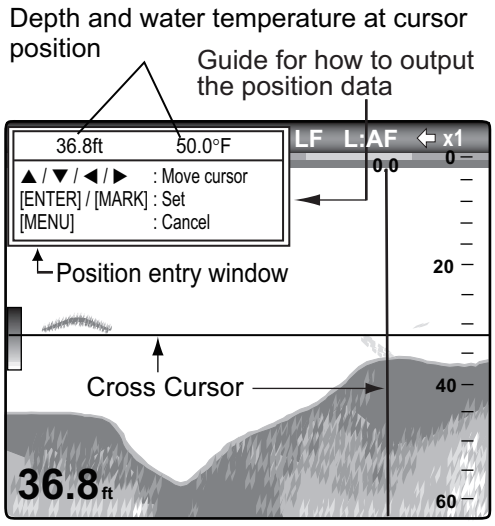


2. Select a function and press the **ENTER** key.

1.17 Position Data

To output the position data, follow the procedure below.

1. Press the **MARK** key. The cross cursor appears on the screen.



Cross cursor

Note: If there is no position data the message "No position data!" appears. Check the navigator.

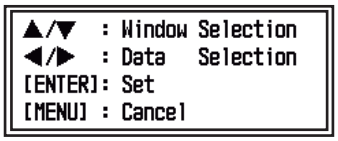
2. Press the TrackPad to set the cross cursor where desired.
3. Press the **MARK** key again to output the position.

1.18 Setting Up Nav Data Displays

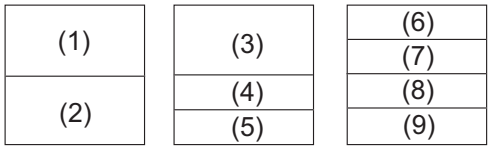
The user may arrange the nav data displays as desired.

1.18.1 Nav data displays

1. Rotate the **MODE** knob to select the Nav data display to change. (This window is displayed for 10 seconds.)



2. Use ▲ or ▼ to select a data display window desired.
3. Use ◀ or ▶ to select the item to display. The items that can be displayed depend on the screen division.



Two-data display | Three-data display | Four-data display

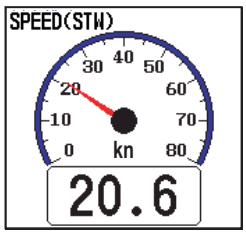
Items displayable in (1) - (3): speed (STW)*, wind speed and direction*, compass*, heading*, depth, position, course, trip meter, odometer, water temperature, air pressure, speed (SOG)*
Items displayable in (4) - (9): depth, position, speed (SOG), speed (STW), course, trip meter, odometer, water temperature, heading, wind speed, wind direction, air pressure

* = Graphic display

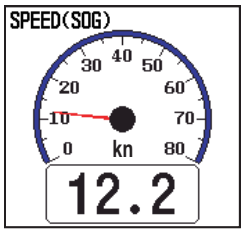
4. Press the **ENTER** key.
   Note: Applicable data must be input to the NMEA port in order to display the data mentioned in the table below.

Necessary data	Item
Longitude/latitude position	Position, course
Bearing	Compass, heading
Ship speed	Speed over the ground
Wind speed, wind angle	Wind speed, wind angle
Atmosphericpressure	Atmosphericpressure

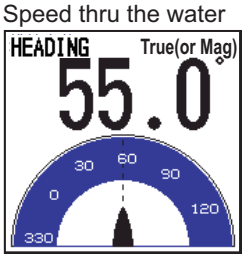
Note: When a data is lost 30 sec., the display shows "- -" at the lost data's location.



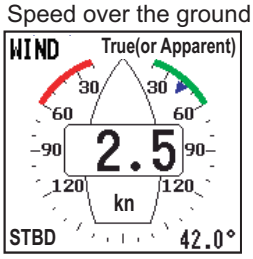
Speed thru the water



Speed over the ground

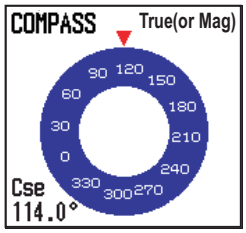


Heading



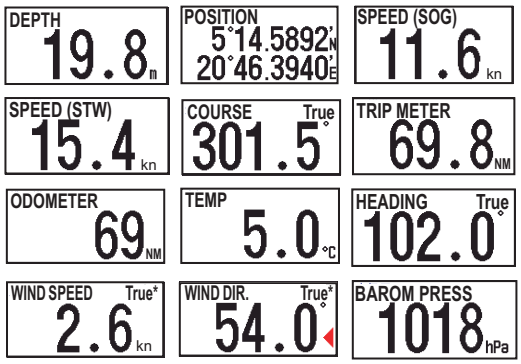
Wind speed and direction

Cse: Course
STBD: Starboard
PORT: Port



Bearing

Graphic displays



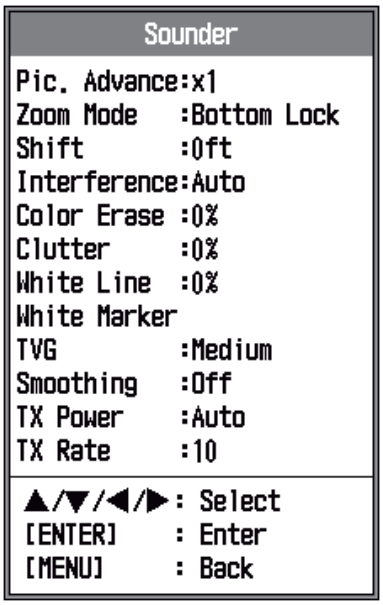
▶: Starboard, ◀: Port
* Wind speed and direction
True: Wind speed and direction when boat is anchored.
Relative: Wind speed and direction when boat is in motion.
Note: [- -] appears when respective data is not received for 30 seconds.

Digital displays

1.19 Menu Description

This section describes menu items not previously mentioned. For the [System] menu, see chapter 2.

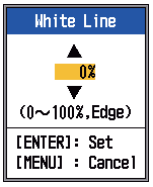
Sounder menu



[Zoom Mode]: Select the zoom display (bottom lock, bottom zoom and marker zoom) to show when "ZOOM" is selected with the MODE knob. For details, see pages 3 and 4.

[White Line]: Display the leading edge of the bottom echo in white to help you distinguish bottom fish from the bottom echo.

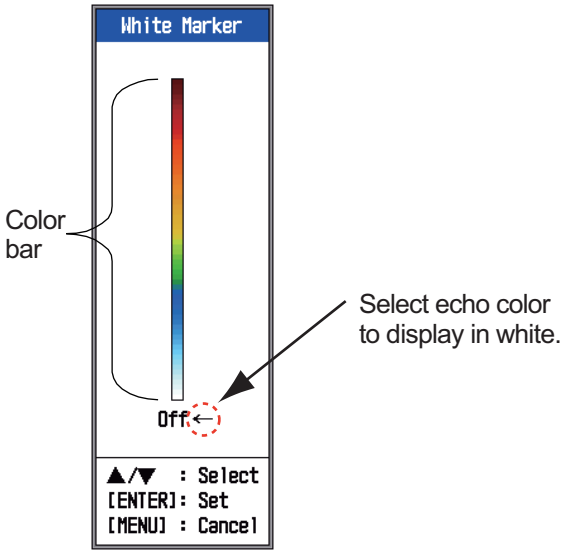
1. Select [White Line] and press the **ENTER** key.



2. Set the width. The larger the number the greater the width of the line. Select [Edge] to show the contour of the bottom in white.
3. Press the **ENTER** key.

[White Marker]: Display the selected echo color in white.

1. Select [White Marker] in the [Sounder] menu and press the **ENTER** key.



2. Use ▲ or ▼ to select color desired. For example, move the arrow to the top of the color bar to display the bottom echo in white. The echo color chosen on the color bar is changed to white. That color is also white on the color bar.
   To turn off the white marker, select [Off].
3. Press the **ENTER** key.
4. To restore the original color, move the arrow to [Off] and press the **ENTER** key.

[TVG]: Two schools of fish of the same size are displayed in different colors between deep water and in shallow water because of the feature of the ultrasound waves. TVG compensates for propagation attenuation of the ultrasound waves. It does this by equalizing echo presentation so that the schools of fish of the same size appear in the same color (echo strength) in both shallow and deep waters. The gain is adjusted automatically depending on the depth. The gain is low at short distance and increases over distance. [High] provides the greatest degree of gain reduction against short range echoes.

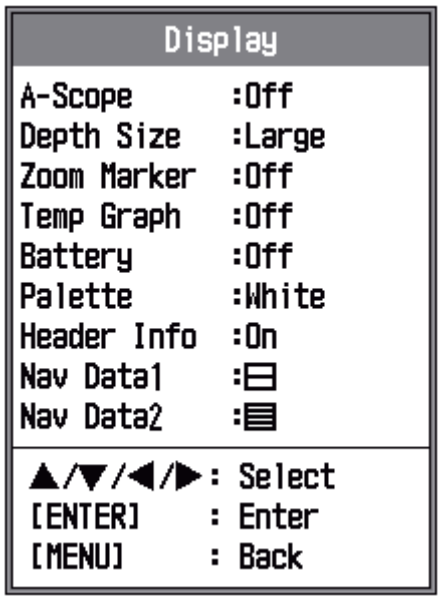
Note: Auto gain must be disabled to use the TVG.

[Smoothing]: Turn smoothing on when echoes appear “spotty” or “jagged”. The default setting is off.

[TX Power]: Interference may appear on the screen when an echo sounder having the same frequency as your own is being operated in the vicinity of your vessel. In this case, lower your TX power and contact the vessel to request them to reduce their TX power. The higher the numeric the greater the TX power. The [Auto] setting automatically adjusts TX power with depth.

[TX Rate]: Change pulse repetition rate. Normally, the highest rate (10) is used. When in shallow waters second reflection echoes may appear between the surface and actual bottom echo. In this case, lower the TX rate level. The setting [MAX] automatically adjusts the frequency and pulse length with depth. The [S] setting, which requires speed data, selects the TX rate according to your boat's speed. A high rate for fast speed; a slow rate for slow speed.

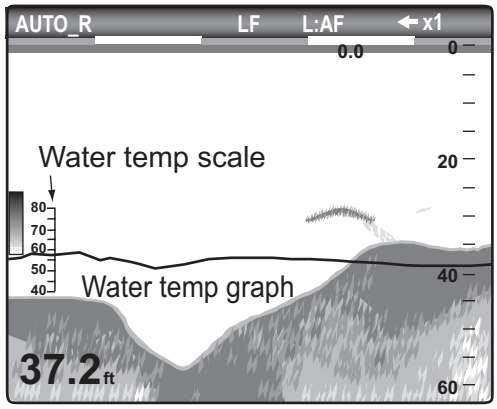
Display menu



[Depth Size]: Select the font size of the depth indication ([Small], [Medium] or [Large]).

[Zoom Marker]: Turn the zoom marker on or off (on the single frequency display) when the bottom lock display, the bottom zoom display or the marker zoom display is active.

[Temp Graph]: Turn the water temperature graph on or off. The temperature scale range is 16°(°F) in [Narrow]; 40°(°F) in [Wide]. Requires water temperature data.



Temperature graph

[Battery]: Turn the battery voltage indication (appears at the top of the screen) on or off. When displayed, the battery indication replaces the picture advance speed indication.

[Palette]: Change the background color of the screen in six colors: White, Blue, Black, Night, Emphasis-BLK and Emphasis-BLU (emphasizes medium strength colors).

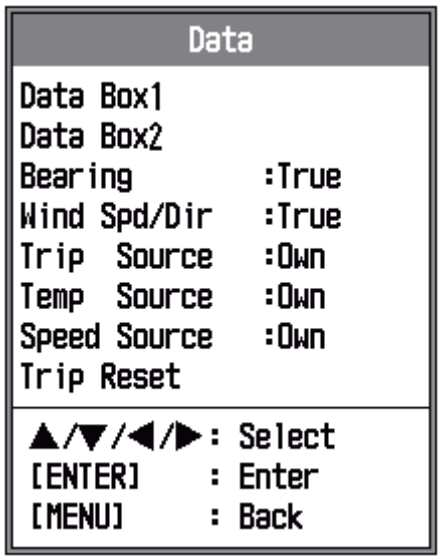
[Header Info]: Turn the operational info display (appears at the top on the screen) on or off.

Note: When the header info is off in the dual frequency display, it is not known which gain (HF or LF) can currently be adjusted. In this case, select the frequency with ◀ (LF) or ▶ (HF), then adjust the gain with the GAIN knob.

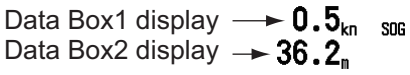
[Nav Data1, Nav Data2]: Set the division configuration of respective displays.

Data menu

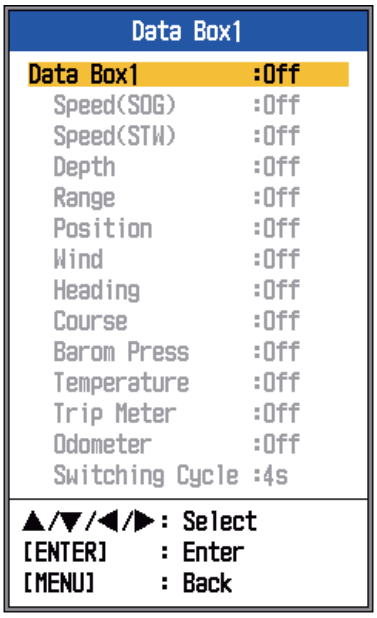
This menu mainly sets up how to display data input by external equipment.



[Data Box1(2)]: Show or hide the Data Box1, Data Box2 indication, which appears below the header info. You can select multiple indications in which case they are displayed alternately every four seconds (default setting).



1. Select [Data Box1] and press the **ENTER** key.



2. Select [Data Box1] and press the **ENTER** key.
3. Select [On] and press the **ENTER** key.
4. Select a data and press the **ENTER** key.
5. Select [On] or [Off] and press the **ENTER** key.
6. Repeat steps 4 and 5 to show or hide other items.
7. Select [Switching Cycle] and press the **ENTER** key.
8. Select the amount of time (in seconds) to show each data and press the **ENTER** key.
9. Set the Data Box 2 similar to how you set the Data Box 1.

[Bearing]: Select the bearing sensor. [True] for gyrocompass, satellite compass; [Mag](netic) for magnetic compass.

[Wind Spd/Dir]: Select the format of wind speed and direction output from a wind sensor, [True] or [Apparent].

[Trip Source]: Select the source for the trip indication: Select [Own] to use the speed data from the speed sensor connected to this unit, or [NMEA] to use speed data from a navigator.

[Temp Source]: Select the source for the water temperature indication: Select [Own] to use the water temperature data from the water temperature sensor connected to this unit, or [NMEA] to use the water temperature data from a navigator.

[Speed Source]: Select the source for speed. Select [Own] to use the speed data from the speed sensor connected to this unit, or [NMEA] to use the speed data from a navigator.

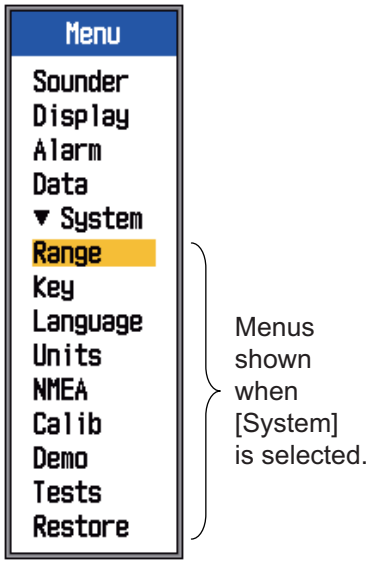
[Trip Reset]: Select [Yes] to reset the trip distance to zero. Two beeps sound after the completion.

2. SYSTEM MENU

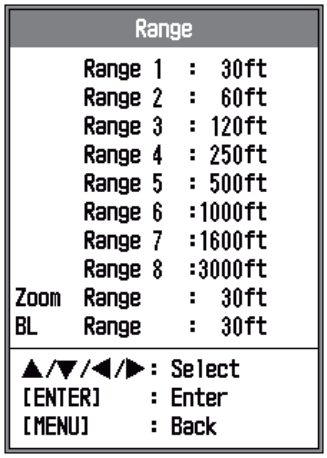
2.1 How to Display the System Menu

The [System] menu mainly consists of items which do not require regular adjustment.

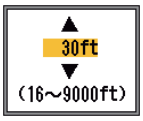
1. Press the **MENU ESC** key to open the menu.
2. Select [System]. For [Tests], and [Restore], see chapter 3. See chapter 4 for "NMEA".



2.2 Range Menu



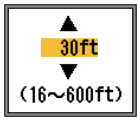
[Range 1] - **[Range 8]**: Set the range of each of the eight ranges. Note that all default ranges are restored whenever the depth unit is changed. Therefore, change the depth unit before changing the preset ranges.



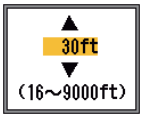
Available range for [Range 1] to [Range 8]: 16 to 9,000 ft

16 to	30 ft,	1 ft step
30 to	500 ft,	10 ft step
500 to	1,000 ft	50 ft step
1,000 to	9,000 ft	100 ft step

[Zoom Range]: Select the range to zoom in the bottom zoom and marker zoom modes.



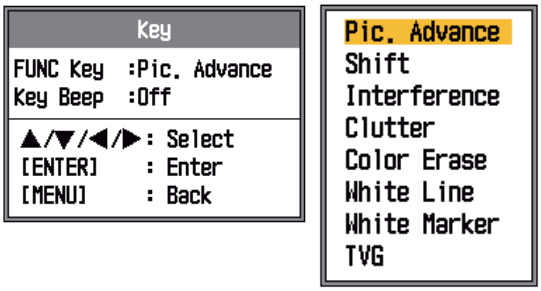
[BL Range]: Select the expansion width for the bottom lock display.



Available range for [Zoom Range] and [BL Range]: 16 to 600 ft

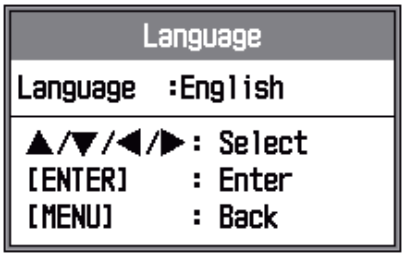
16 to	30 ft,	1 ft step
30 to	500 ft,	10 ft step
500 to	600 ft,	50 ft step

2.3 Key Menu



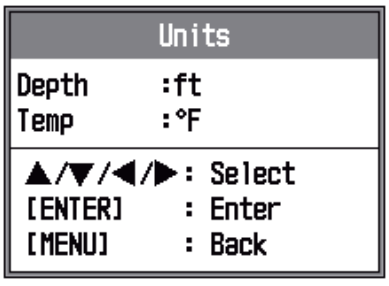
[FUNC Key]: Select the item to program to the **FUNC** key. The programming can also be done by long-pressing the **FUNC** key. See paragraph 1.16.2.
[Key Beep]: Turn key beep on or off.

2.4 Language Menu



[Language]: The system language is available in English, French, Spanish, Simplified Chinese, Thai, Vietnamese, and Indonesian. To change the language, select the appropriate language and press the **ENTER** key.

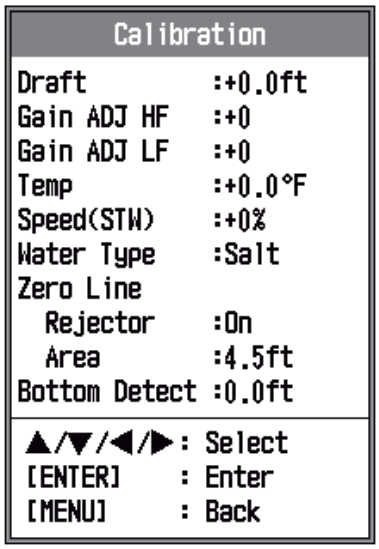
2.5 Units Menu



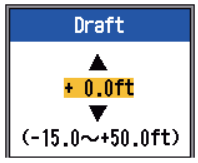
[Depth]: Select unit of depth measurement, between [m], [ft] and [fm].

[Temp]: Select unit of water temperature measurement, between °C and °F. Water temperature data is required.

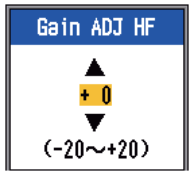
2.6 Calib Menu



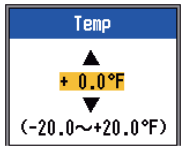
[Draft]: The default depth display shows the distance from the transducer. If you would rather show the distance from the sea surface, set your ship's draft.



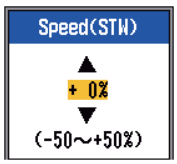
[Gain ADJ HF], **[Gain ADJ LF]**: If the gain is too high or too low, or the gain for the low and high frequencies appears unbalanced, you can compensate it here.



[Temp]: If the water temperature indication is wrong, you can correct it here. For example, if the water temperature indication is 2° higher than actual water temperature, enter -2.



[Speed (STW)]: If the speed indication is wrong, you can correct it here. For example, if the speed indication is 10% lower than actual speed, enter +10.



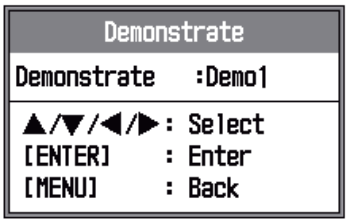
[Water Type]: Select the water type with which to use the equipment, from [Salt] or [Fresh]. Select correct water type to get accurate depth data.

[Zero Line Rejector]: Turn the zero line (transmission line) on or off. When turned on, the transmission line disappears, which allows you to see fish echoes near the surface clearly. The length of the transmission line changes with transducer used and installation characteristics. If the width of the transmission line is 4.5 ft (default value) or more, set the transmission line width with [Zero Line Area], as below.

[Zero Line Area]: This feature adjusts the transmission line so that the transmission line disappears when the menu item [Zero Line Rejector] is turned on. For a long tail, increase the value. If the transmission line does not disappear, lower the TX power.

[Bottom Detect]: In some installations the tail of the TX line or the echo afterglow can be mistaken for the bottom echo. If this occurs, raise this setting to solve the problem. Too low a setting may prevent display of the bottom echo.

2.7 Demo Menu



[Demonstrate]: The demonstration mode provides, without connection of the transducer, simulated operation of the equipment, using internally generated echoes. All controls are operative. The message [DEMO] appears at the bottom center of the screen when the demonstration mode is active.

- [Off]: Deactivate the demonstration mode.
- [Demo1]: Shallow depth demonstration.
- [Demo2]: Deep depth demonstration.

3. MAINTENANCE, TROUBLESHOOTING

⚠ WARNING

ELECTRICAL SHOCK HAZARD
Do not open the equipment.

Only qualified personnel can work inside the equipment.

IMPORTANT

Do not apply paint, anti-corrosive sealant or contact spray to coating or plastic parts.

Those items contain organic solvents that can damage coating and plastic parts, especially plastic connectors.

3.1 Maintenance

Regular maintenance is essential for good performance. Check the items listed in the table below monthly to help keep your equipment in good shape for years to come.

Item	Action
Transducer cable	Check cable for damage.
Power cable, transducer cable plug	Check that they are tightly fastened. Refasten if necessary.
Display unit ground	Check for corrosion. Clean if necessary.
Power supply voltage	Check voltage. If out of rating correct problem.

3.2 How to Clean the Display Unit

Dust or dirt may be removed from the cabinet with a soft cloth. Water-diluted mild detergent may be used if desired. DO NOT use chemical cleaners to clean the display unit; they may remove paint and markings. Wipe the LCD carefully to prevent scratching, using the cleaning cloth provided and an LCD cleaner. To remove dirt or salt deposits, use an LCD cleaner, wiping slowly with a cleaning cloth so as to dissolve the dirt or salt. Do not use solvents such as thinner, acetone or benzene for cleaning. Also, do not use degreaser or anti-fog solution on the LCD, as they can strip the coating on the LCD.

3.3 Transducer Maintenance

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

3.4 How to Replace the Fuse

If you cannot turn on the power, the fuse (Type: FGBO-A 125V 3A PBF, Code No.: 000-155-850-10) may have blown. Find the cause before replacing the fuse. If the fuse blows after replacement, contact your dealer for advice.

⚠ WARNING

Use the proper fuse.

Use of a wrong fuse can result in fire and damage the equipment.

3.5 Battery Voltage Alert

A battery icon appears at the top of the display when the battery voltage is too high or too low.

Icon	Meaning
	Voltage is lower than 10 VDC. If the voltage goes below 9 V, the equipment is automatically turned off.
	Voltage is higher than 33.2 VDC. If the voltage goes higher than 34.2 V, the equipment is automatically turned off.

3.6 Troubleshooting

The table below provides basic troubleshooting procedures which the user may follow to restore normal operation.

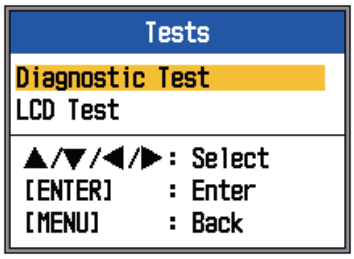
Troubleshooting table

If…	Then check…
the screen is blank	• adjust the brilliance.
neither echo nor fixed range scale appears	• battery voltage. • fuse. • power cable connection. • breaker.
no echo appears but the fixed range scale appears	• if display advance speed is set to [Stop]. • transducer connector. • transducer cable.
echo appears but zero line does not	• if range shifting is set to "0". • if zero line rejection is “Off”. • draft setting; it should be other than “0”.
sensitivity is low	• gain setting. • if air bubbles or marine life is not clinging to the transducer face. • if sediments are present in the water. • if the bottom is too soft to return an echo.
there is extreme interference or noise	• if the transducer is too close to the engine. • if the unit is properly grounded. • if other echo sounders of the same frequency as own are being operated nearby.
the speed/water temperature readout is unrealistic or not present	• sensor plug.
the position readout is unrealistic or not present	• the connection between fish finder and navigator. • navigator.

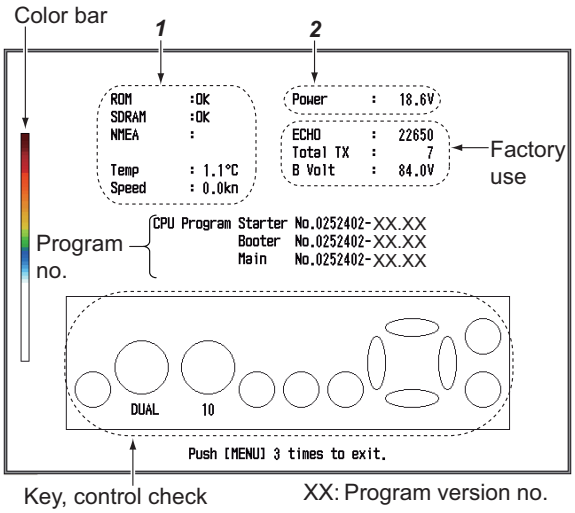
3.7 Diagnostics

If you feel your unit is not working properly, conduct the diagnostic test to find the problem. If you cannot restore normal operation, contact your dealer for advice.

1. Open the menu and select [Tests] under [System] and press the **ENTER** key.



2. Use ▲ or ▼ to select [Diagnostic] Test and press the **ENTER** key.



No.	Test item	Content
1	ROM	"OK" is shown if check is normal; "NG" for fault.
	SDRAM	
	NMEA	Reserved for factory use. Special connector required. Nothing appears unless the connector is used.
	Water temp.	Water temp. and speed from the re-spective sensors. Up-dated every three seconds.
	Speed	
2	Power	Voltage of power source. Updated every three seconds.

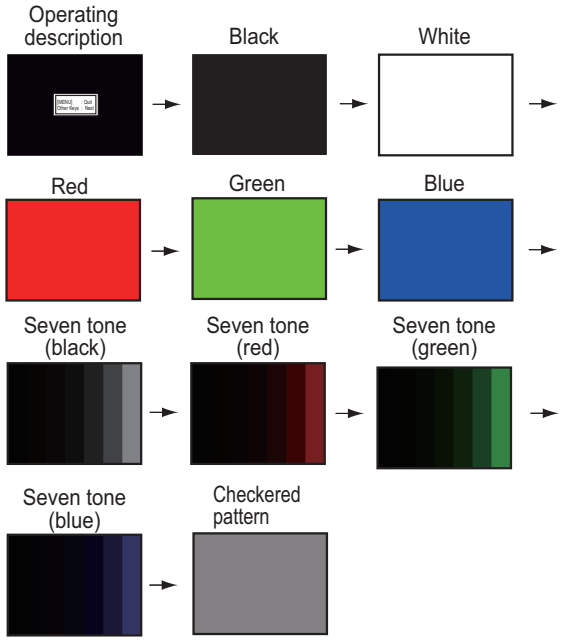
3. The ovals and circles at the bottom of the test display are for checking the controls.
How to check key and TrackPad: Press each key and the arrows on the TrackPad one by one. A key's (or arrow's) corresponding on-screen oval "lights" in red if the control is normal. Press the same key and the oval turns white.
How to check GAIN knob: Rotate the knob. The indication goes higher with clockwise rotation; lower with counter-clockwise rotation. Press the knob. The knob's corresponding on-screen circle "lights" in red if the knob is normal. Press the knob and the circle turns white.
How to check MODE knob: Rotate the knob. The corresponding on-screen circle "lights" in red and white alternately and the name of the setting selected appears.
4. To quit the test, press the **MENU ESC** key three times to close the test menu.

3.8 LCD Test

This feature tests the LCD for proper display of colors.

Note: To review the seven-tone screen easily, set the brilliance to maximum before starting the test.

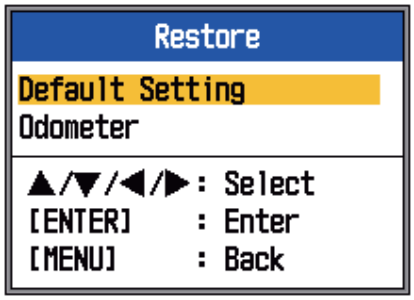
1. Open the menu and select [Tests] (under [System]) and press the **ENTER** key.
2. Use ▲ or ▼ to select [LCD Test] and press the **ENTER** key.
3. Press any key except **MENU ESC** key to start the test. The entire screen changes as below with each press of any key except **MENU ESC** key. After the checkered pattern, the [Tests] menu appears.



3.9 How to Clear the Memory, Reset the Odometer

You can restore default menu settings and reset the odometer (trip distance indication) as follows.

1. Open the menu and select [Restore] (under [System]) and press the **ENTER** key.



2. Select [Default Setting] or [Odometer] as appropriate and press the **ENTER** key.
   [Default Setting]: Restore all default menu settings (excluding language).
   [Odometer]: Reset the odometer to zero.
3. Use ▲ to select [Yes] and press the **ENTER** key.
   For [Odometer], the unit beeps after the reset is completed. For [Default Setting], the unit beeps and then the startup screen appears followed by the [Installation] menu. Select appropriate language and press the **MENU ESC** key twice.

4. INSTALLATION

4.1 Equipment Lists

Standard supply

Name	Type	Code No.	Qty	Remarks
Display Unit	CV-288	–	1	
Installation Materials			1 set	See packing list at back of this manual.
Spare Parts			1 set	

Option

Name	Type	Code No.	Remarks
Transducer	See next page	–	
Thru-hull pipe		–	
Tank		–	
Hard Cover	02-160-1091-2		For Display Unit
Cable	MJ-A6SPF0003-050C	000-154-054-10	One end 6 pin, 5 m, for navigator
	CO-SPEVV-SB-C 2Px0.2 LF	000-111-680-10	5 m
		000-120-792-10	10 m
		000-120-793-10	15 m
Water temperature sensor	T-04MSB	000-026-893	Thru-hull type
	T-04MTB	000-026-894	Transom type
Speed/Temperature sensor	ST-02MSB	000-137-986-01	Thru-hull type
	ST-02PSB	000-137-987-01	Thru-hull type
Rectifier	PR-62	000-013-484	100 VAC
		000-013-485	110 VAC
		000-013-486	220 VAC
		000-013-487	230 VAC
Strain Relief Plate	OP02-85	001-188-530	For WAGO connectors

Combination of transducer, thru-hull pipe and tank

The contents in the table below are for your information only. Some tanks are not RoHS compliant.

Output (W)	Frequency (kHz)	Ship type	Transducer	Thru-hull pipe	Tank
1k/1k	50/200	Steel	50/200-1T	TFB-5000(1)	T-603
		FRP		TRB-1000(1) or TRB-1200(1)	T-603-F
1k/2k	50/200	Steel	50B-9B 200B-8/8B	TWB-6000(2)	T-658
		FRP		–	–
2k/2k	50/200	Steel	50BL-12HR 200B-8/8B	TFB-7000(2) or TWB-6000(2)	T-693
		FRP		TRB-1100(2) or TWB-6000(2)	T-693-F
3k/3k	50/200	Steel	50BL-24HR 200B-12H	TFB-7000(2) or TWB-6000(2)	T-683
		FRP		TRB-1100(2)	T-683-F
1k	50	Steel	50B-6/6B	TFB-5000(1)	T-605
		FRP		TRB-1000(1)	T-605-F
		Steel	50B-9B	TFB-5000(1)	T-603
		FRP		TRB-1000(1) or TRB-1200(1)	T-603-F
	200	Steel	200B-5S	TFB-5000(1)	T-605
		FRP		TRB-1000(1)	T-605-F
2k	50	Steel	50BL-12HR	TFB-5000(1)	T-702
		FRP		TRB-1000(1)	T-702-F
	200	Steel	200B-8/8B	TFB-5000(1)	T-608
		FRP		TRB-1000(1) or TRB-1200(1)	T-608-F
	50/200	Steel	CM444	TFB-7000(1)	Local supply
		FRP		TRB-1100(1)	Local supply
3k	50	Steel	50BL-24HR	TFB-4000(1)	T-616
		FRP		TRB-1000(1)	T-616-F
	200	Steel	200B-12H	TFB-5000(1)	T-615
		FRP		TRB-1000(1)	T-615-F

4.2 Display Unit

NOTICE

Do not apply paint, anti-corrosive sealant or contact spray to coating or plastic parts of the equipment.

Those items contain organic solvents that can damage coating and plastic parts, especially plastic connectors.

⚠ WARNING

Turn off the power at the switchboard before beginning the installation. Connect to a dedicated breaker in the power distributor.

Fire or electrical shock can result if the power is left on.

Mounting considerations

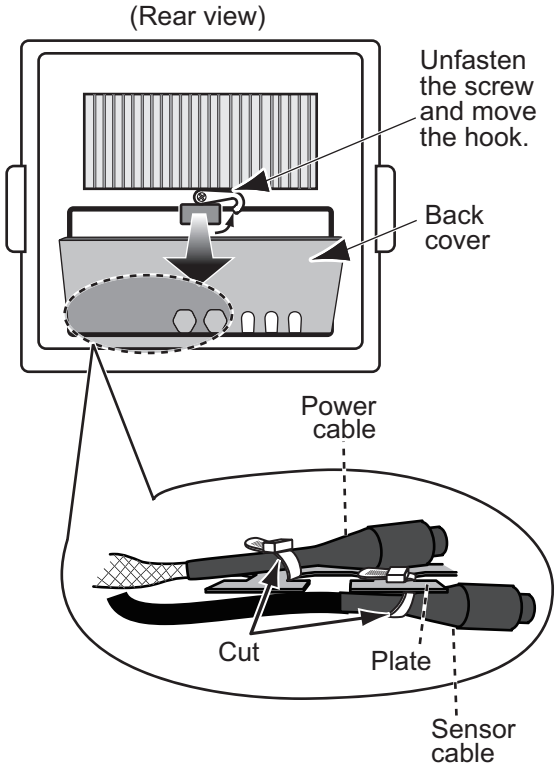
- Locate the unit out of direct sunlight.
- Select a location where the display screen can be easily observed while operating the control panel.
- Leave sufficient space around the unit for maintenance and servicing. Recommended maintenance space appears in the outline drawings at the back of this manual.
- Locate the unit in a protected area away from direct exposure to rain and salt spray.
- Observe the compass safe distances on page ii to prevent deviation of a magnetic compass.

The display unit is designed to be mounted on a tabletop. Mount the unit, referring to the outline drawings at the back of this manual.

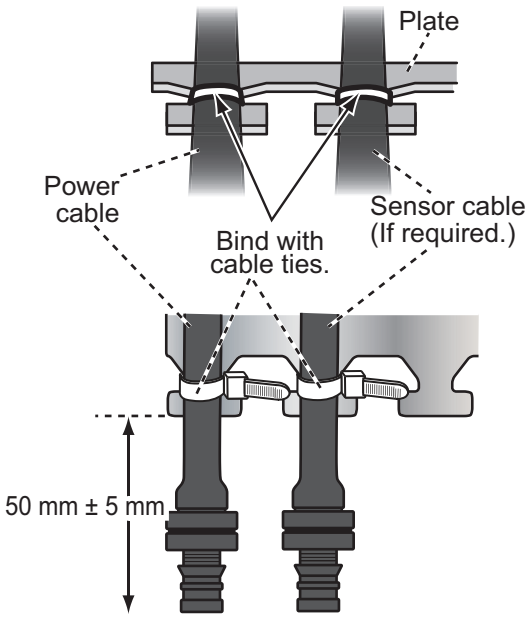
The power cable is connected to the terminal board in the display unit. Therefore the power cable can not be disconnected easily like a connector. So connect the cable to a dedicated breaker on the mains switchboard.

Preparation for installation

1. Open the back cover.The power cable and water temperature/speed sensor cable are tied to a plate with cable ties.Cut the cable tie which binds the power cable.



2. Put the power cable on the plate and bind it with a cable tie. If the water temperature/speed sensor will not be used, leave the sensor cable as it is. If the water temperature/speed sensor is required, put the sensor cable on the plate and bind it with a cable tie.



4.3 Transducer

The performance of the echo sounder depends upon the transducer position. A place least affected by air bubbles should be selected since turbulence blocks the sounding path. Further, select a place least influenced by engine noise. It is known that air bubbles are fewest at the place where the bow first falls and the next wave rises, at usual cruising speed.

Note: The face of the transducer must be facing the sea bottom in normal cruising trim of the boat.

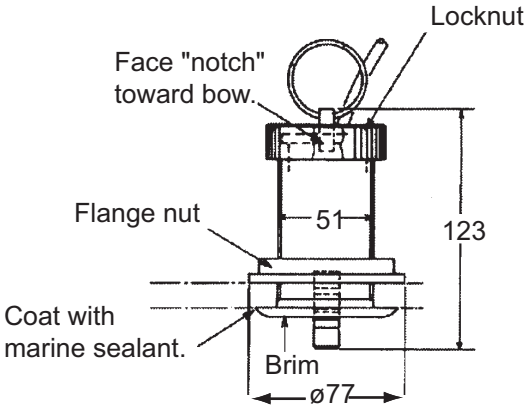
4.4 Water Temperature/Speed Sensor

Through-hull mount water temperature/speed sensor ST-02MSB, ST02-PSB

Select a suitable mounting location considering the following:

- Select a mid-boat flat position. The sensor does not have to be installed perfectly perpendicular. The sensor must not be located where it might get damaged in dry-docking operation.
- Select a place apart from equipment generating heat.
- Select a place in the forward direction viewing from the drain hole, to allow for circulation of cooling water.
- Select a place free from vibration.

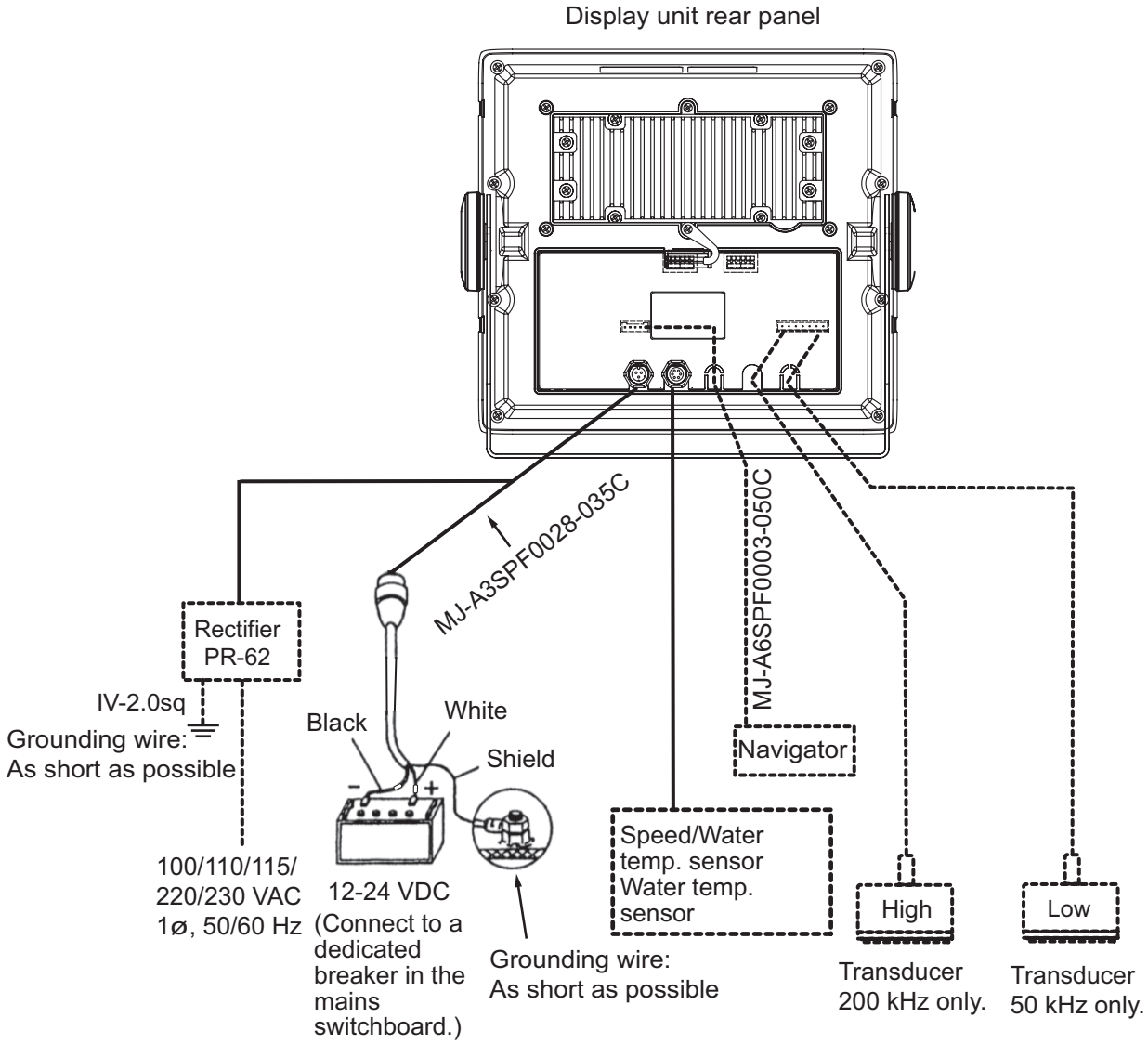
1. Dry-dock the boat.
2. Make a hole of approx. 51 mm diameter.
3. Unfasten the locknut and remove the flange of the sensor.
4. Apply high-grade sealant to the flange of the sensor.
5. Pass the sensor casing through the hole.
6. Face the notch on the sensor toward boat's bow and tighten the flange.
7. Set the sensor section to the sensor casing and tighten the locknut.
8. Launch the boat and check for water leakage around the sensor.



Water temperature/speed sensor ST-02MSB, ST-02PSB

4.5 Wiring

Refer to the interconnection diagram at the back of this manual for detailed information.

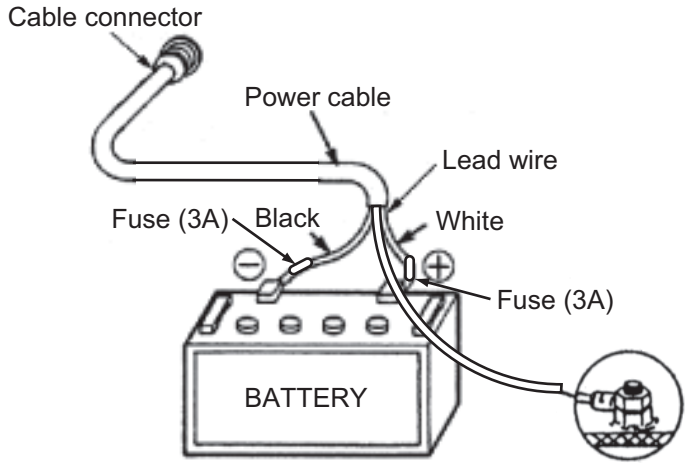


Wiring diagram for FCV-288

4.6 Cable Fabrication

Power cable

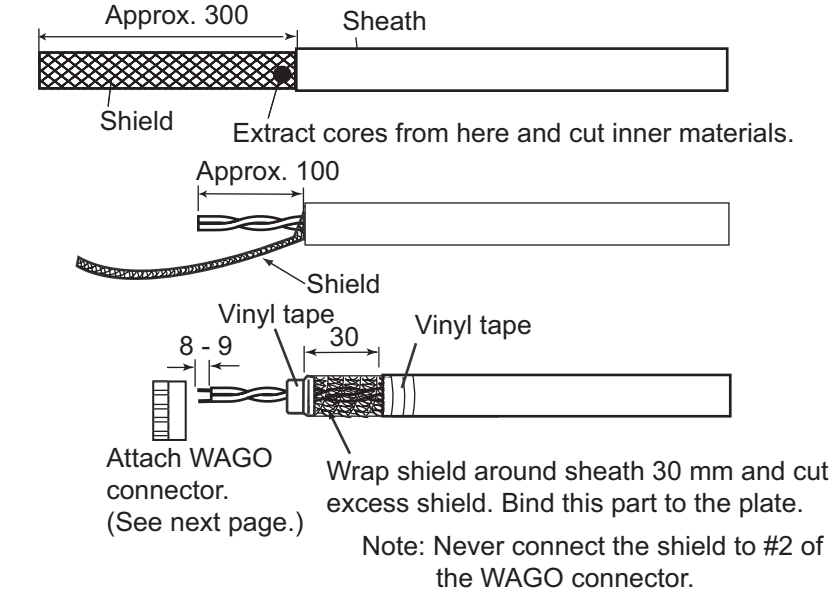
Connect the power cable to the power connector. Connect the leads to the battery (12 or 24 VDC); white to plus(+) terminal and black to minus(-) terminal. Connect the shield to ship's ground.



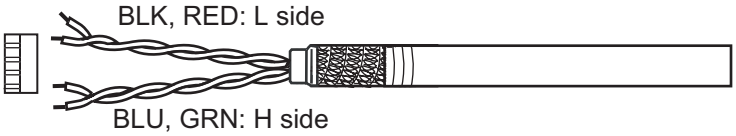
Note: The fuse is not waterproof. Wrap the fuse holder with vinyl tape to keep water out of the fuse holder.

Transducer cable

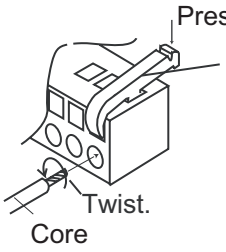
Separate the transducer cable well away from power cables to prevent interference. Connect the cable to the transducer port (for high frequency and/or low frequency) at the rear of the display unit. Fabricate the cable as below.



[Composite transducer]

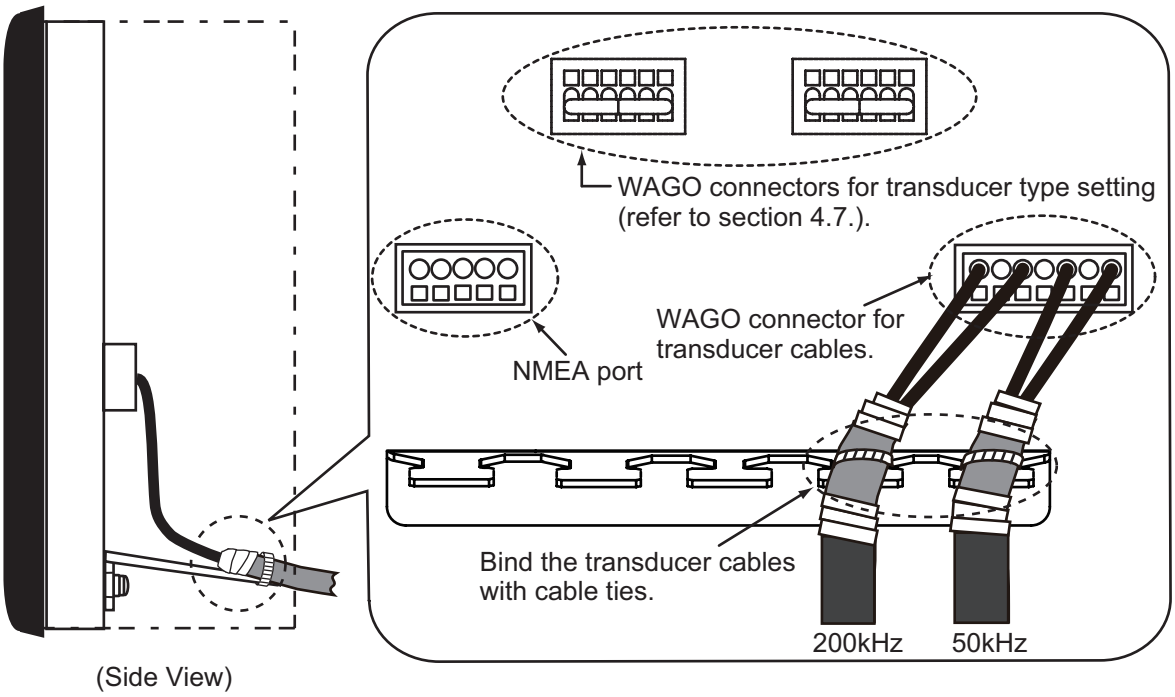


WAGO connector (for transducer and NMEA ports)



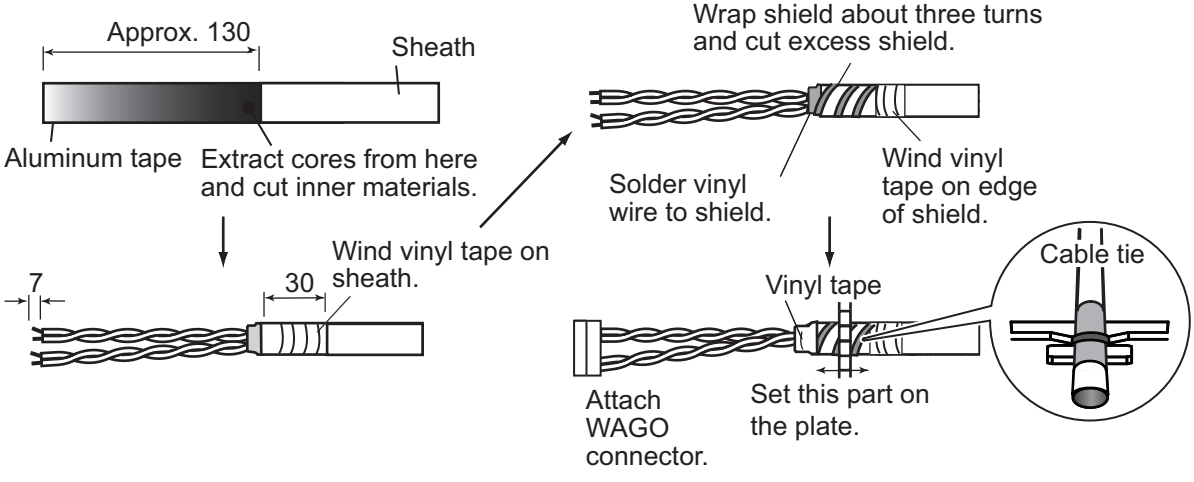
1. Twist conductors.
2. Insert opener and press it down.
3. Insert core to hole.
4. Release opener.
5. Pull the core to confirm that it is tightly fastened.

Attach the WAGO connectors (with cables). Bind the sheaths of cables to the plate with the cable ties.



NMEA port

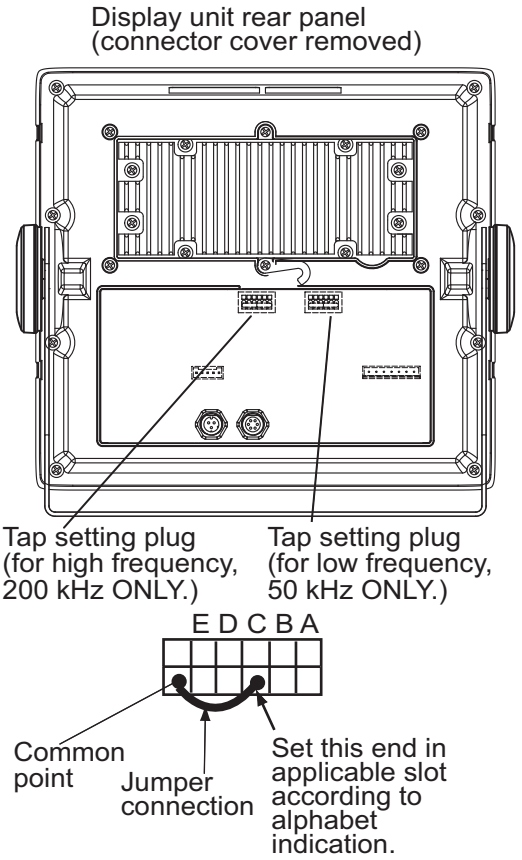
Connect a GPS navigator, etc. to NMEA port TB2 #1 to #4. #1 and #2 are for data output from this echo sounder. #3 and #4 are for data input from navigational equipment. #5 is for shield.



4.7 Transducer Setting

Tap location

Set the tap according to the transducer type. Refer to the tap setting table below. The optional strain relief plate provides easy access to the WAGO connectors.



Transducer type and tap setting

The following table shows the transducers programmed in the FCV-288.

Type	Output (kW)	Tap
50B-6	1	A
50B-6B	1	A
50/200-1T (50 kHz)	1	A
50B-9B	1	A
50BL-12HR	2	C
50BL-24HR	3	E
200B-5S	1	E
50/200-1T (200 kHz)	1	E
200B-8	2	D
200B-8B	2	D
200B-12H	3	C
CM444 (50 kHz)	2	D
CM444 (200 kHz)	2	E

4.8 Input/Output Sentences

The table below shows the NMEA0183 data sentences which can be input to and output from your fish finder. The transmission speed for both input and output is 4,800 bps. Data is output at two-second intervals.

Input sentences

Sentence	Data	Remarks
GGA	Time, Global positioning system (GPS) fix data	GPS position
GLL	Geographic position - latitude and longi-tude	GPS position
GNS	GNSS position fixing	
HDG	Ship's heading, devi-ation, variation	
HDT	True heading	
MDA	Weather information, atmospheric pressure	
MTW	Water temperature	
MWV	Wind direction, wind speed (true or ap-parent)	
RMA	Recommended mini-mum specific LO-RAN-C data. Latitude, longitude, TD, ground speed and course	Loran C
RMC	Recommended mini-mum specific GPS/TRANSIT data. Lati-tude and longitude, speed over ground and course over ground	GPS
VHW	True/magnetic bear-ing, speed through water	
VTG	Speed over ground and course over ground	

Output sentences

Sentence	Data	Remarks
DBS	Depth below sea surface	
DBT	Depth below transducer	
DPT	Depth below transducer and offset	
MTW*	Water tempera-ture	Output only when [Temp Source] of [Data] menu is set to [Own] and data from a water tem-perature sensor is input.
TLL*	Marker line posi-tion	Output only when **MARK** or **ENTER** key is pressed.
VHW*	Speed thru water	Output only when [Speed Source] of [Data] menu is set to [Own].

*: Available with connection of applicable sensor or navaid.

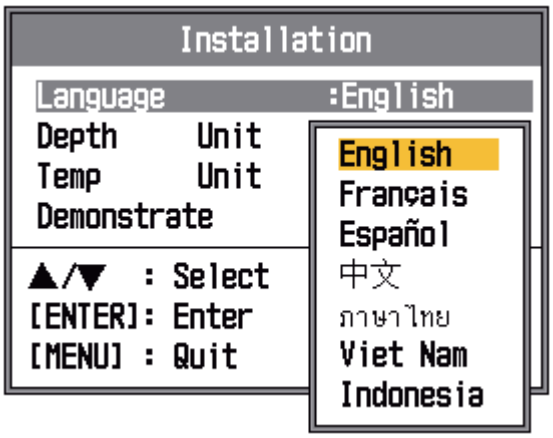
Order of priority

Data	Priority
Latitude/Longitude:	GNS>GGA>RMC>RMA>GLL
Course (true):	VTG>RMC>RMA
Course (magnetic):	VTG
Ground speed:	VTG>RMC>RMA
Water speed:	VHW
Heading (true):	HDT>VHW
Heading (magnetic):	HDG>VHW
Atmospheric pressure:	MDA
Water temperature:	MTW
Wind speed andangle (true/apparent):	MWV

4.9 Adjustments after Installation

Language

1. Press the ⏻ **BRILL** key to show the [Installation] menu.

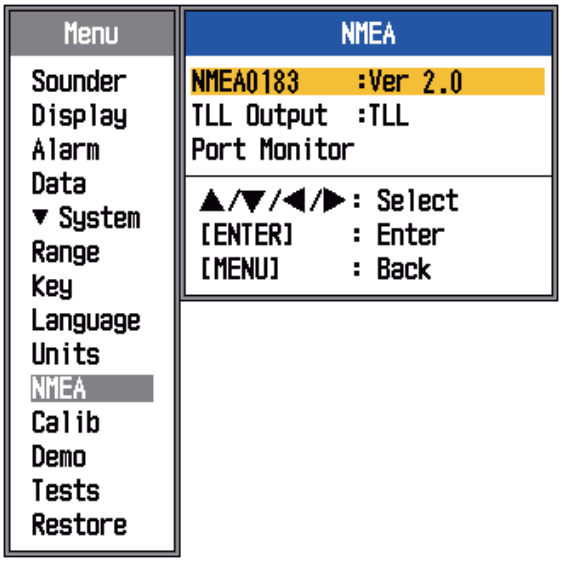


2. Select your language and press the **ENTER** key. The units for depth and water temperature are set according to the language selected.
3. Press the **MENU/ESC** key twice to finish.

4.10 NMEA Port Setting

If a GPS navigator and/or other sensor are connected to the NMEA port, set up the port as follows:

1. Press the **MENU** key.
2. Press to select [System] and [NMEA] and then press the **ENTER** key.



NMEA setting menu

3. Press ▼ to select the item to set and then press the **ENTER** key.
4. Press ▼ or ▲ to select an appropriate one and then press the **ENTER** key.

Description for each item of the NMEA menu

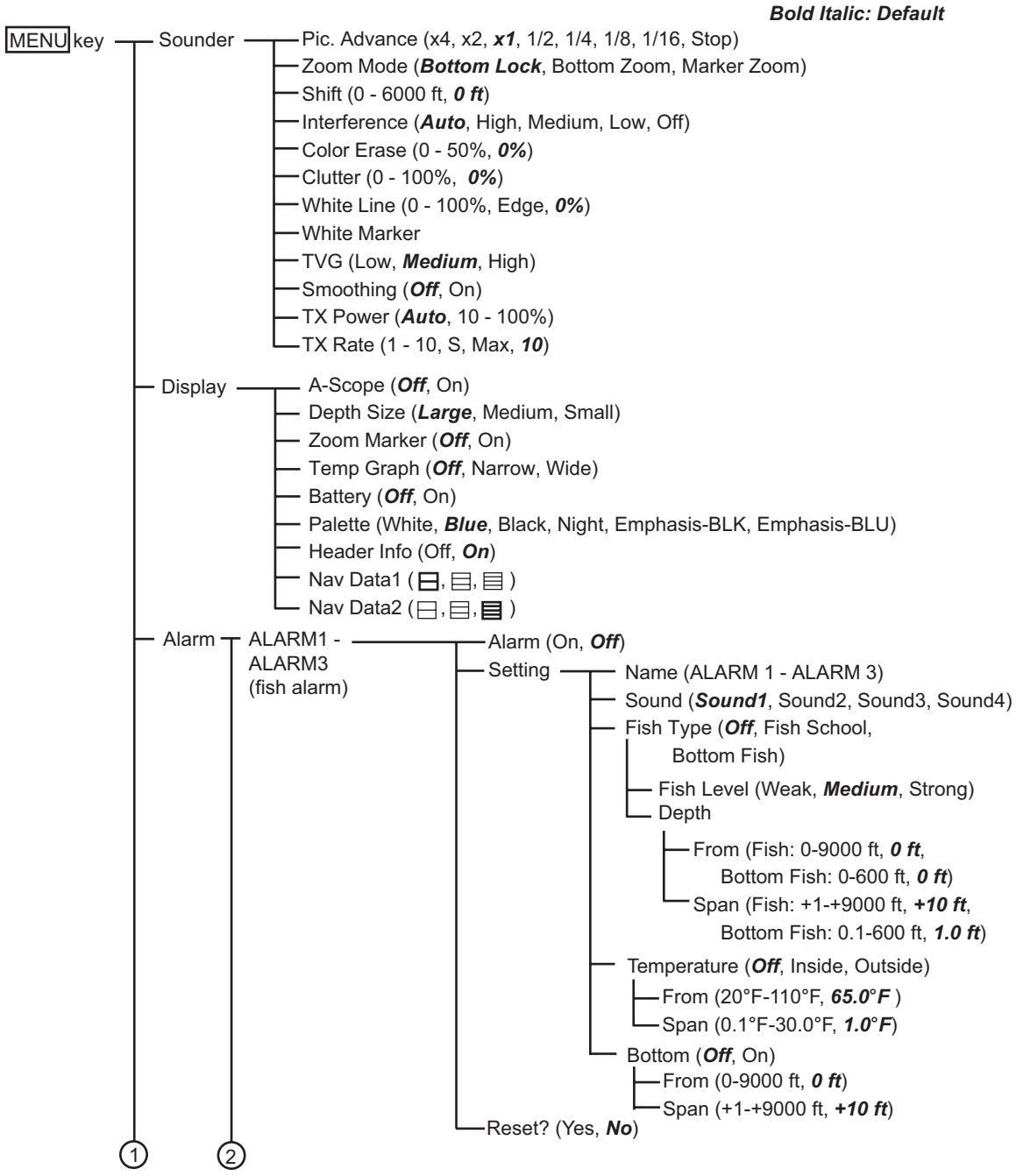
NMEA0183: Choose NMEA0183 version of navigation equipment connected to the NMEA port, among Ver. 1.5, Ver. 2.0 or Ver. 3.0.

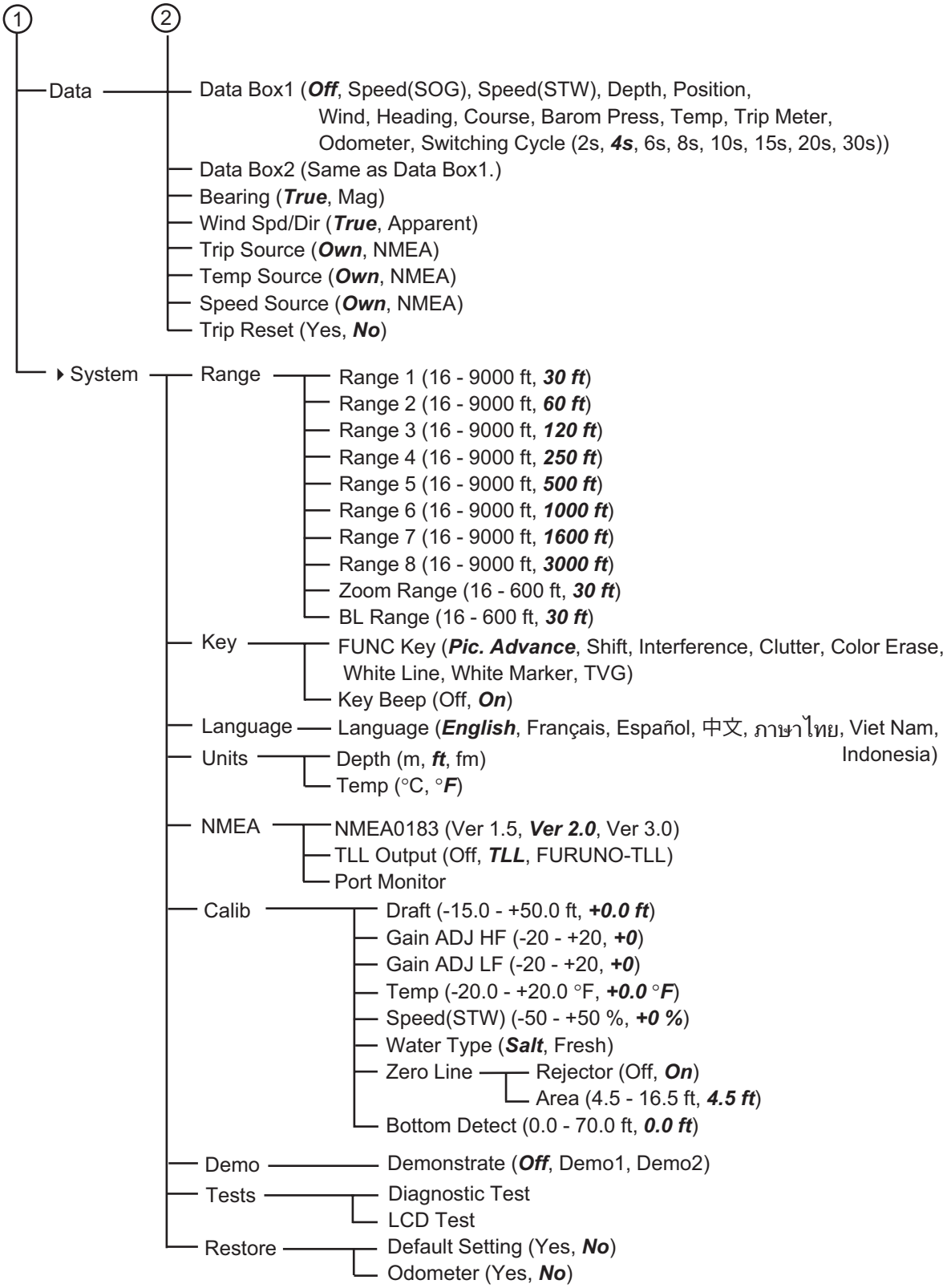
TLL Output: Output the position selected by the **MARK** key to the plotter connected.

- [Off]: Does not output latitude/longitude.
- [TLL]: Outputs latitude/longitude.
- [FURUNO-TLL]: Outputs latitude/longitude, depth and water temperature. This requires FURUNO-TLL enabled device.

Port Monitor: Port Monitor provides information for the data sentences input to the NMEA port. Press the **ENTER** key to display the latest data sentence information. To terminate the port monitor, press **MENU** key.

APPENDIX 1 MENU TREE




1
2
Data
Data Box1 (**Off**, Speed(SOG), Speed(STW), Depth, Position, Wind, Heading, Course, Barom Press, Temp, Trip Meter, Odometer, Switching Cycle (2s, **4s**, 6s, 8s, 10s, 15s, 20s, 30s))
Data Box2 (Same as Data Box1.)
Bearing (**True**, Mag)
Wind Spd/Dir (**True**, Apparent)
Trip Source (**Own**, NMEA)
Temp Source (**Own**, NMEA)
Speed Source (**Own**, NMEA)
Trip Reset (Yes, **No**)
System
Range
Range 1 (16 - 9000 ft, **30 ft**)
Range 2 (16 - 9000 ft, **60 ft**)
Range 3 (16 - 9000 ft, **120 ft**)
Range 4 (16 - 9000 ft, **250 ft**)
Range 5 (16 - 9000 ft, **500 ft**)
Range 6 (16 - 9000 ft, **1000 ft**)
Range 7 (16 - 9000 ft, **1600 ft**)
Range 8 (16 - 9000 ft, **3000 ft**)
Zoom Range (16 - 600 ft, **30 ft**)
BL Range (16 - 600 ft, **30 ft**)
Key
FUNC Key (**Pic. Advance**, Shift, Interference, Clutter, Color Erase, White Line, White Marker, TVG)
Key Beep (Off, **On**)
Language
Language (**English**, Français, Español, 中文, ภาษาไทย, Viet Nam, Indonesia)
Units
Depth (m, **ft**, fm)
Temp (°C, °**F**)
NMEA
NMEA0183 (Ver 1.5, **Ver 2.0**, Ver 3.0)
TLL Output (Off, **TLL**, FURUNO-TLL)
Port Monitor
Calib
Draft (-15.0 - +50.0 ft, **+0.0 ft**)
Gain ADJ HF (-20 - +20, **+0**)
Gain ADJ LF (-20 - +20, **+0**)
Temp (-20.0 - +20.0 °F, **+0.0 °F**)
Speed(STW) (-50 - +50 %, **+0 %**)
Water Type (**Salt**, Fresh)
Zero Line
Rejector (Off, **On**)
Area (4.5 - 16.5 ft, **4.5 ft**)
Bottom Detect (0.0 - 70.0 ft, **0.0 ft**)
Demo
Demonstrate (**Off**, Demo1, Demo2)
Tests
Diagnostic Test
LCD Test
Restore
Default Setting (Yes, **No**)
Odometer (Yes, **No**)

APPENDIX 2 INSTALLATION OF TEMPERATURE SENSORS

The installation instructions in this chapter are copied from the manufacturer's (AIRMAR© Technology Corporation) installation guide, which is included with your sensor.
The model numbers mentioned within the documentation should be read as follows:
• T42 → T-04MSB
• T80 → T-04MTB

OWNER'S GUIDE & INSTALLATION INSTRUCTIONS

Thru-Hull, Analog

High-Precision Temperature Sensor

Model **T42**

05/28/14

17-437-02 rev. 01

Follow the precautions below for optimal product performance and to reduce the risk of property damage, personal injury, and/or death.

WARNING: Always wear safety goggles and a dust mask when installing.

WARNING: Immediately check for leaks when the boat is placed in the water. Do not leave the boat unchecked for more than three hours. Even a small leak can allow considerable water to accumulate.

CAUTION: Never install a bronze sensor in a metal hull because electrolytic corrosion will occur.

CAUTION: Never install a metal sensor on a vessel with a positive ground system.

CAUTION: Never pull, carry, or hold the sensor by its cable; this may sever internal connections.

CAUTION: Never use solvents. Cleaner, fuel, sealant, paint, and other products may contain solvents that can damage plastic parts, especially the sensor's face.

IMPORTANT*:* Read the instructions completely before proceeding with the installation. These instructions supersede any other instructions in your instrument manual if they differ.

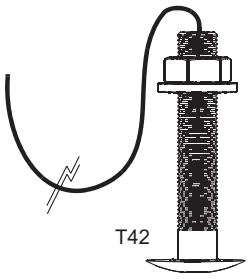
Applications

- Bronze sensor recommended for fiberglass or wood hull only.
- The hull must be a minimum of 8mm (5/16") thick at the mounting location.

Mounting Location

Choose a location where the temperature sensor will be in contact with the water at all times.

Record the information found on the cable tag for future reference.
Part No._____Date_____



Tools & Materials

Safety goggles

Dust mask

Electric drill

Drill bit/hole saw/spade bit:

Pilot hole	3mm *or* 1/8"
T42	22mm *or* 7/8"

Sandpaper

Mild household detergent *or* weak solvent (alcohol)

Marine sealant (suitable for below waterline)

Slip-joint pliers

Installation in a cored fiberglass hull (see page 2)

Hole saw for hull interior: 30mm *or* 1-1/4"

Cylinder, wax, tape, and casting epoxy

Water-based anti-fouling paint (**mandatory in salt water**)

Sensor Installation

Hole Drilling

Cored fiberglass hull *— Follow separate instructions on page 2.*

1. Drill a 3mm or 1/8" pilot hole from inside the hull. If there is a rib, strut, or other hull irregularity near the selected mounting location, drill from the outside.
2. Using the appropriate drill bit, cut a hole perpendicular to the hull from outside the boat.
3. Sand and clean the area around the hole, inside and outside, to ensure that the marine sealant will adhere properly to the hull. If there is any petroleum residue inside the hull, remove it with either mild household detergent or a weak solvent (alcohol) before sanding.

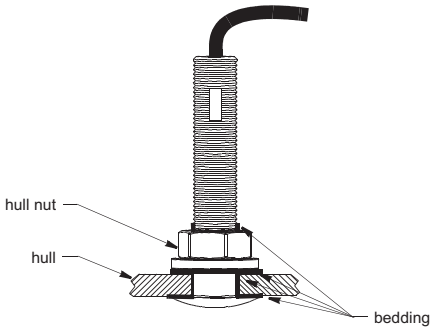


Figure 1. Bedding and installing

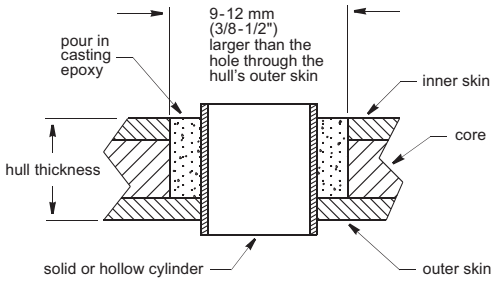


Figure 2. Preparing a cored fiberglass hull

Bedding

CAUTION: Be sure all surfaces to be bedded are clean and dry.

1. Remove the hull nut (see Figure 1).
2. Apply a 2 mm (1/16") thick layer of marine sealant around the flange of the sensor that will contact the hull and up the stem. The sealant must extend 6 mm (1/4") higher than the combined thickness of the hull and the hull nut. This will ensure that there is marine sealant in the threads to seal the hull and hold the hull nut securely in place.
3. Apply a 2 mm (1/16") thick layer of marine sealant to the flange of the hull nut that will contact the hull.

Installing

1. From outside the hull, thread the cable through the mounting hole.
2. Push the sensor into the mounting hole using a twisting motion to squeeze out excess marine sealant (see Figure 1).
3. From inside the hull, slide the hull nut onto the cable. Screw the hull nut in place. Tighten it with slip-joint pliers.
   Cored fiberglass hull—Do not over tighten, crushing the hull.
   Wood hull—Allow for the wood to swell before tightening.
4. Remove any excess marine sealant on the outside of the hull to ensure smooth water flow over the sensor.

Checking for Leaks

When the boat is placed in the water, **immediately** check around the thru-hull sensor for leaks. Note that very small leaks may not be readily observed. Do not to leave the boat in the water for more than 3 hours before checking it again. If there is a small leak, there may be considerable bilge water accumulation after 24 hours. If a leak is observed, repeat “Bedding” and “Installing” **immediately** (see page 2).

Cable Routing & Connecting

CAUTION: If the sensor came with a connector, do not remove it to ease cable routing. If the cable must be cut and spliced, use Airmar’s splash-proof Junction Box No. 33-035 and follow the instructions supplied. Removing the waterproof connector or cutting the cable, except when using a water-tight junction box, will void the sensor warranty.

1. Route the cable to the instrument being careful not to tear the cable jacket when passing it through the bulkhead(s) and other parts of the boat. Use grommet(s) to prevent chafing. To reduce electrical interference, separate the transducer cable from other electrical wiring and the engine. Coil any excess cable and secure it in place with cable ties to prevent damage.
2. Refer to the instrument owner’s manual to connect the transducer to the instrument.

Installation in a Cored Fiberglass Hull

The core (wood or foam) must be cut and sealed carefully. The core must be protected from water seepage, and the hull must be reinforced to prevent it from crushing under the hull nut allowing the sensor to become loose.

CAUTION: Completely seal the hull to prevent water seepage into the core.

1. Drill a 3 mm or 1/8" pilot hole from inside the hull. If there is a rib, strut, or other hull irregularity near the selected mounting location, drill from the outside. (If the hole is drilled in the wrong location, drill a second hole in a better location. Apply masking tape to the outside of the hull over the incorrect hole and fill it with epoxy.)
2. Using the 21 mm or 7/8" drill bit, cut a hole from outside the hull through the *outer* skin only (see Figure 2).
3. From inside the hull using the 30 mm or 1-1/4" hole saw, cut through the *inner* skin and most of the core. The core material can be very soft. Apply only light pressure to the hole saw after cutting through the inner skin to avoid accidentally cutting the *outer* skin.
4. Remove the plug of core material so the *inside* of the outer skin and the inner core of the hull is fully exposed. Clean and sand the inner skin, core, and the outer skin around the hole.
5. Coat a hollow or solid cylinder of the correct diameter with wax and tape it in place. Fill the gap between the cylinder and hull with casting epoxy. After the epoxy has set, remove the cylinder.
6. Sand and clean the area around the hole, inside and outside, to ensure that the sealant will adhere properly to the hull. If there is any petroleum residue inside the hull, remove it with either mild household detergent or a weak solvent (alcohol) before sanding.
7. Proceed with “Bedding” and “Installing” (see page 2).

Maintenance & Replacement

Aquatic growth can accumulate rapidly on the sensor's surface reducing its performance within weeks. Clean the surface with a Scotch-Brite® scour pad and mild household detergent taking care to avoid making scratches. If the fouling is severe, lightly wet sand with fine grade wet/dry paper.

Anti-fouling Paint

Surfaces exposed to salt water must be coated with anti-fouling paint. *Use water-based anti-fouling paint only.* Never use ketone-based paint since ketones can attack many plastics possibly damaging the sensor. Reapply anti-fouling paint every 6 months or at the beginning of each boating season.

Replacement Sensor & Parts

The information needed to order a replacement sensor is printed on the cable tag. Do not remove this tag. When ordering, specify the part number and date. For convenient reference, record this information at the top of page one.

Lost, broken, or worn parts should be replaced immediately.

Hull nut	02-031-3

Obtain parts from your instrument manufacturer or marine dealer.

Gemeco	Tel:	803-693-0777
(USA)	Fax:	803-693-0477
	email:	sales@gemeco.com
Airmar EMEA	Tel:	+33.(0)2.23.52.06.48
(Europe, Middle East, Africa)	Fax:	+33.(0)2.23.52.06.49
	email:	sales@airmar-emea.com

OWNER'S GUIDE & INSTALLATION INSTRUCTIONS

Surface Mount, Analog

Temperature Sensor

Model **T80**

05/28/14

17-584-01 rev. 01

Follow the precautions below for optimal product performance and to reduce the risk of property damage, personal injury, and/or death.

WARNING: Always wear safety goggles and a dust mask when installing.

WARNING: **Below the waterline mount**—When the boat is placed in the water, immediately check for leaks around the screws and any other holes drilled in the hull.

CAUTION: **Installation on a metal hull**—The stainless steel housing must be isolated from a metal hull to prevent electrolytic corrosion. Use marine sealant.

CAUTION: Never install a metal sensor on a vessel with a positive ground system.

IMPORTANT*:* Read the instructions completely before proceeding with the installation. These instructions supersede any other instructions in your instrument manual if they differ.

Applications

- Measures air or water temperature.
- Stainless steel sensor is compatible with all hull materials. Recommended for aluminum hulls to prevent electrolytic corrosion, provided the stainless steel sensor is isolated from the metal hull by using marine sealant.

Mounting Location

The sensor can be mounted anywhere that you want to know the temperature. For example, you can mount the sensor on the transom, in the live well, or in the engine compartment.

If you are measuring water temperature, choose a location where the sensor will be in contact with the water at all times.

Record the information found on the cable tag for future reference.

Part No._____Date_____

Tools & Materials

Safety goggles
Dust mask
Pencil
Electric drill
Drill bit/hole saw/spade bit:
- Pilot holes — 3mm *or* 1/8"
- Transom hole (some installations) — 18mm *or* 3/4"

2 Stainless steel, self-tapping screws — 4 x 18mm *or* #8 x 3/4"
Marine sealant (suitable for below waterline)
Screwdriver(s)
Cable clamp(s) (some installations)
Grommet(s) (some installations)
Cable ties

Installation

Mounting on the transom

CAUTION: Mount the sensor as close to the centerline (keel) of the boat as possible to ensure the sensor remains in the water when the boat is turning (see Figure1).

CAUTION: Fiberglass hull—Minimize surface cracking by running the drill in reverse until the gelcoat is penetrated.

CAUTION: If the sensor came with a connector, do not remove it to ease cable routing. If the cable must be cut and spliced, use Airmar's splash-proof Junction Box No. 33-035 and follow the instructions provided. Removing the waterproof connector or cutting the cable, except when using a water-tight junction box, will void the sensor warranty.

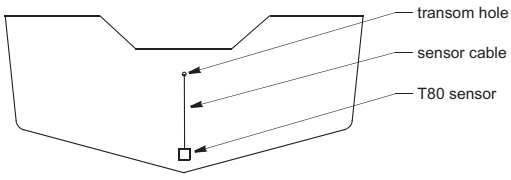


Figure 1. Mounting on the transom

Mount the sensor near the centerline and close to the bottom of the transom.

Route the sensor cable over the transom, through a drain hole, or through a hole that you have drilled in the transom **above the waterline**.

1. Place the sensor against the hull and mark the position of the screw holes with a pencil.
2. Using a 3mm or 1/8" drill bit, drill pilot holes at the marked locations, 10mm (3/8") deep.
3. Apply marine sealant to the threads of the purchased screws to prevent water from seeping into the transom.
4. Screw the temperature sensor to the hull.
5. If a hole must be drilled through the transom, choose a location **well above the waterline**. Check for obstructions such as trim tabs, pumps, or wiring inside the hull. Mark the location with a pencil. Drill a hole through the transom using the appropriate size hole saw or spade bit (to accommodate the connector). Do NOT remove the connector.
6. Route the cable over or through the transom.
7. On the outside of the hull, secure the cable against the transom using a purchased cable clamp(s). Mark the position of the screw hole(s) with a pencil.
8. Using a 3mm or 1/8" drill bit, drill a pilot hole(s) at the marked locations, 10mm (3/8") deep.
9. Apply marine sealant to the threads of the screw(s) to prevent water from seeping into the transom.
10. Fasten the cable clamp(s) in place.
11. If a hole has been drilled through the transom, apply marine sealant to the space around the cable leading through the transom.

Cable Routing & Connecting

1. Route the cable to the instrument, being careful not to tear the cable jacket when passing it through the bulkhead(s) and other parts of the boat. To reduce electrical interference, separate the sensor cable from other electrical wiring and sources of noise. Coil any excess cable and secure it in place with cable ties to prevent damage.
2. Refer to the instrument owner's manual to connect the sensor to the instrument.

Replacement Sensor & Parts

The information needed to order a replacement sensor is printed on the cable tag. Do not remove this tag. When ordering, specify the part number and date. For convenient reference, record this information at the top of page one.

Obtain parts from your instrument manufacturer or marine dealer.

Gemeco	Tel:	803-693-0777
(USA)	Fax:	803-693-0477
	email:	sales@gemeco.com
Airmar EMEA	Tel:	+33.(0)2.23.52.06.48
(Europe, Middle East, Africa)	Fax:	+33.(0)2.23.52.06.49
	email:	sales@airmar-emea.com

SPECIFICATIONS OF COLOR LCD FISH FINDER
FCV-288

1 GENERAL

1.1	TX frequency	50 kHz and 200 kHz, dual frequency transmission
1.2	Output power	1, 2 or 3 kW selectable
1.3	Power reduction	Auto, 10 to 100% (10% step)
1.4	TX rate	Max. 3000 pulse/min
1.5	Pulse length	Max. 3 msec

2 DISPLAY UNIT

2.1	Display mode	10.4-inch color LCD, 640 x 480 dots
2.2	Brilliance	300 cd
2.3	Echo color	64 colors
2.4	Background color	Selectable among 6 colors
2.5	Range shift	Range: 5-3,000 m, Shift: 0-2,000 m, Expansion range: 5-200 m
2.6	Display mode	Single-frequency, Dual-frequency, Zoom, NAV 1/2, A-scope
2.7	Zoom display	Bottom-lock expansion, Bottom zoom, Marker zoom
2.8	Picture advance speed	7 steps (Lines/TX: Stop, 1/16, 1/8, 1/4, 1/2, 1/1, 2/1, 4/1), Synchronize w/ ship's speed
2.9	Alarm	Fish (Normal/Bottom), Water temperature, Bottom
2.10	Automatic indication	Automatic gain adjust (fishing/cruising), Automatic range Water temperature graph (optional sensor required)

3 INTERFACE

3.1	Number of port	NMEA0183 Ver.1.5/2.0/3.0 (I/O)····· 1 port
3.2	Input data	GGA, GLL, GNS, HDG, HDT, MDA, MTW, MWV, RMA, RMC, VHW, VTG
3.3	Output data	DBS, DBT, DPT, MTW*, TLL, VHW *: Optional sensor required

4 POWER SUPPLY

4.1	Display unit	12-24 VDC: 2.3-1.2 A
4.2	Rectifier (PR-62, option)	100/110/220/230 VAC, 1 phase, 50/60Hz

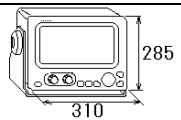
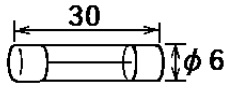
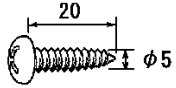
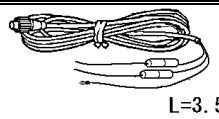
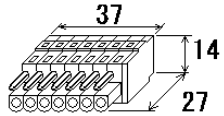
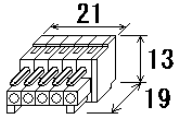
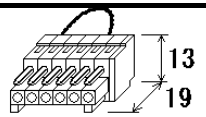
5 ENVIRONMENTAL CONDITIONS

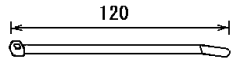
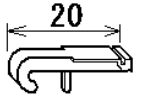
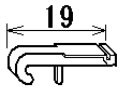
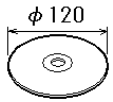
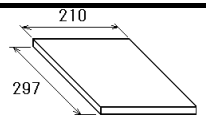
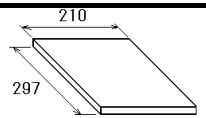
5.1	Ambient temperature	-15°C to +55°C
5.2	Relative humidity	93% at +40°C
5.3	Degree of protection	Panel: IPX2, Chassis: IPX0

6 COATING COLOR

6.1	Display unit	N2.5

PACKING LIST FCV-288

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット UNIT			
DISPLAY UNIT		CV-288-* 000-021-052-00 **	1
予備品 SPARE PARTS			
ﾋｭｰｽﾞ GLASS TUBE FUSE		FGBO-A 125V 3A PBF 000-155-850-10	2
工事材料 INSTALLATION MATERIALS			
+ﾄﾗｽﾀｯﾋﾟﾝﾈｼﾞ 1ｼｭ SELF-TAPPING SCREW		5X20 SUS304 000-162-608-10	4
ｹｰﾌﾞﾙ組品MJ POWER CABLE ASSY.		MJ-A3SPF0028-035C 000-164-952-10	1
ｺﾈｸﾀ(231) CONNECTOR		231-307/026-FUR 000-159-663-12	1
ｺﾈｸﾀ(734) CONNECTOR		734-205-FUR 000-147-411-12	1
ｺﾈｸﾀ(組品) CONNECTOR ASSY		734206-1JP-#18-L50 000-167-274-10	2

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ｺﾝﾍﾞｯｸｽ NYLON CABLE TIE		CV-120L 999-999-171-00	5
操作ﾚﾊﾞｰ TERMINAL OPENER		231-131 000-165-800-11	1
操作ﾚﾊﾞｰ TERMINAL OPENER		734-230 000-147-417-10	1
図書 DOCUMENT			
OPERATOR'S MANUAL CD		FCV-288 O/M *CD-ROM* 999-999-199-00	1 (*1)
OPERATOR'S MANUAL		OME-23830-* 000-176-579-1*	1 (*1)
OPERATOR'S MANUAL		OZS-23830-* 000-176-580-1*	1 (*1)

CODE NUMBER ENDING WITH "**" INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

(*1)INDICATE SPECIFICATION SELECTIVE ITEM.

(略図の寸法は、参考値です。DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

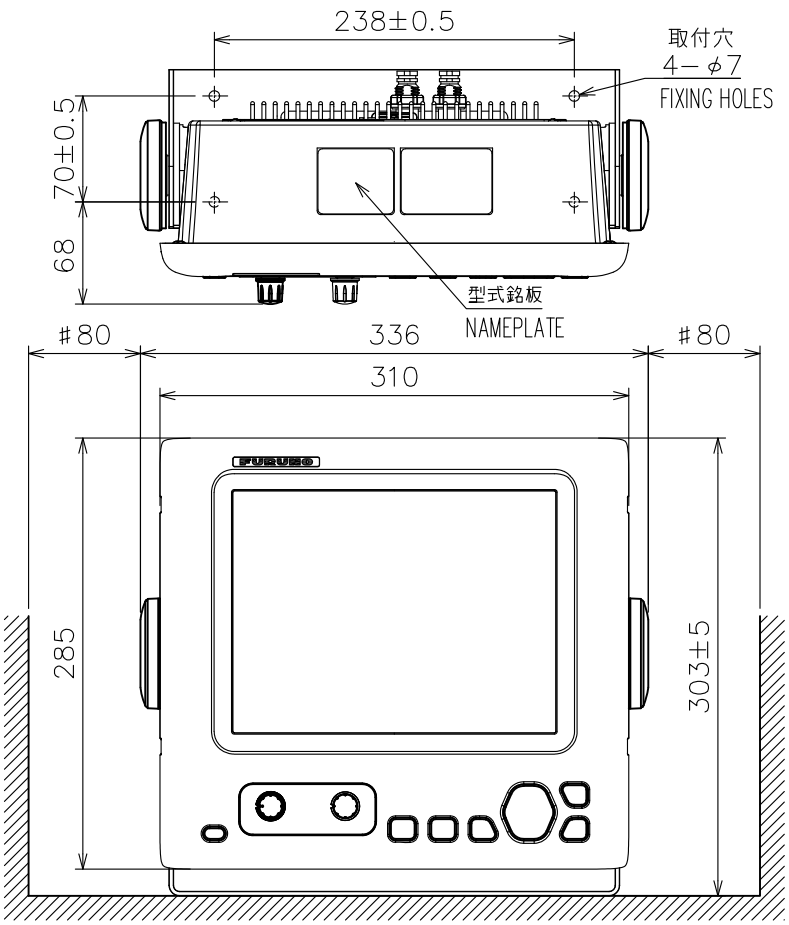
型式/ｺｰﾄﾞ番号が2段の場合、下段より上段に代わる過渡期品であり、どちらかが入っています。 なお、品質は変わりません。

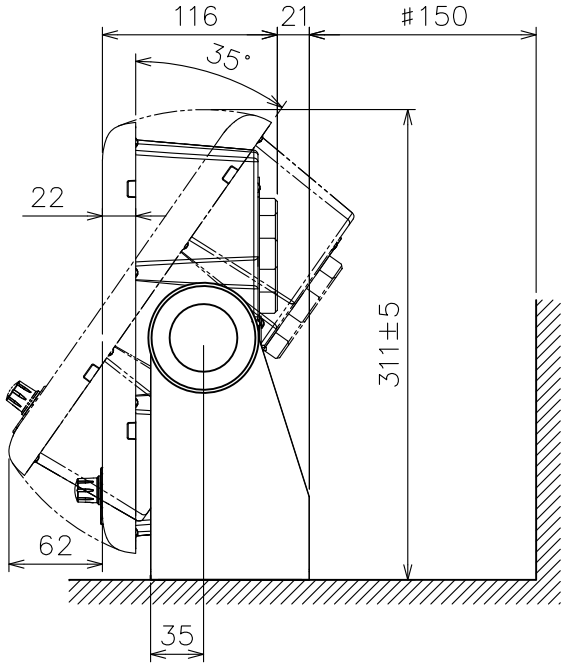
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.

A-1

☆

FURUNO





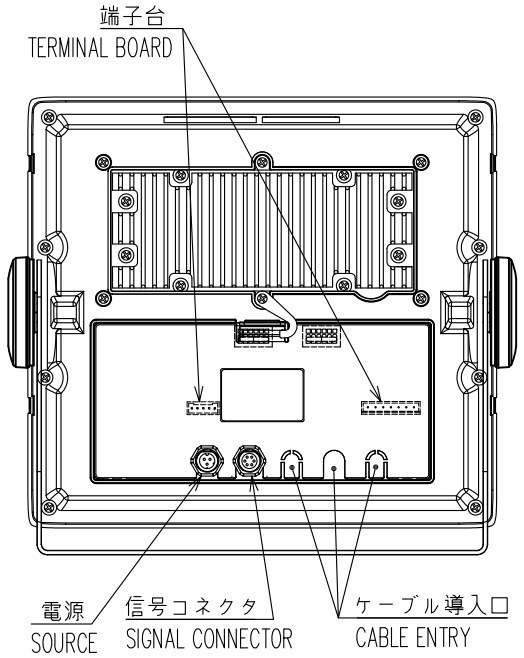


表 1　TABLE 1

寸法区分（mm）DIMENSION	公差（mm）TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3

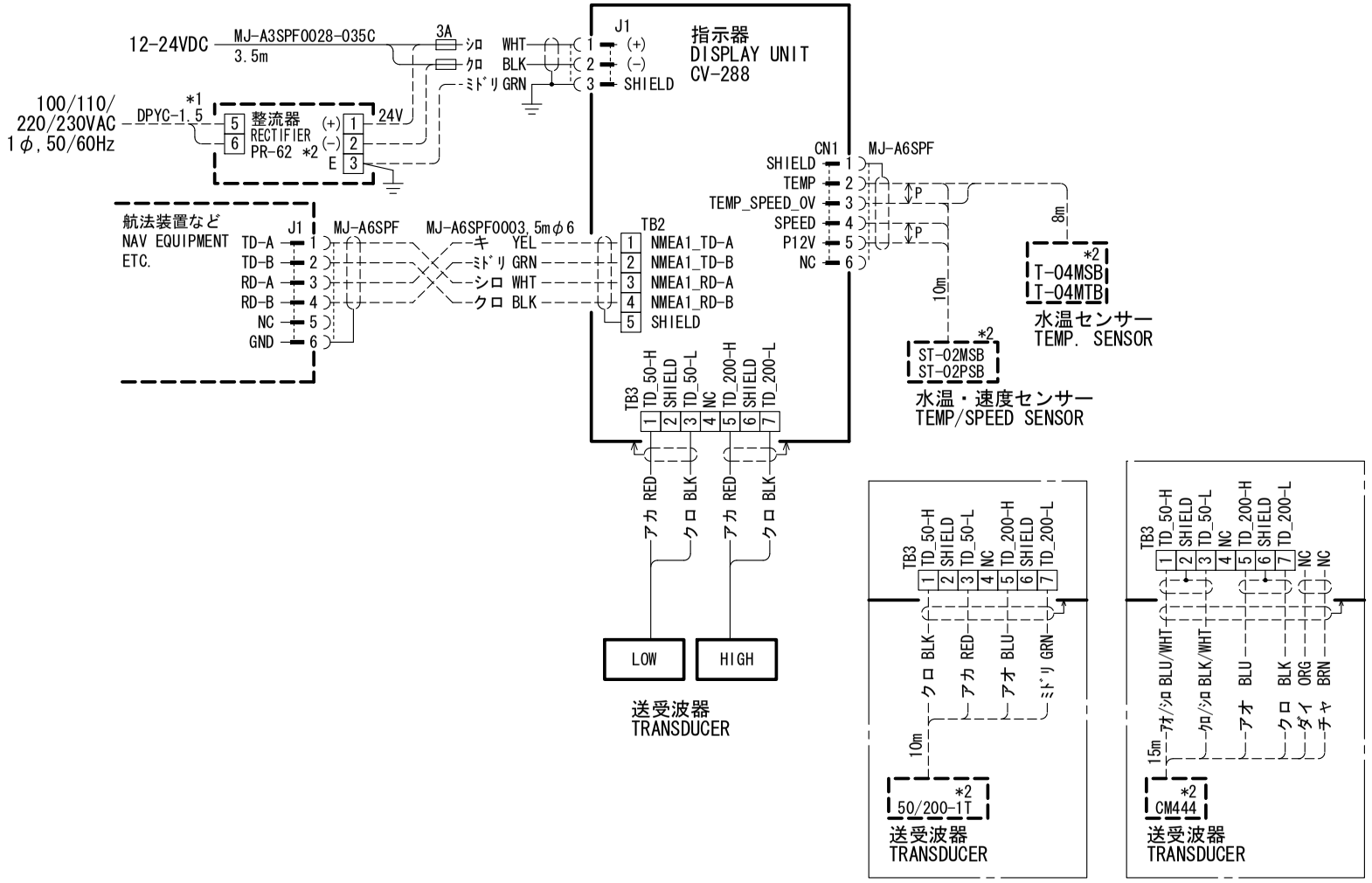
注　記
1）指定外の寸法公差は表1による。
2）＃印寸法は最小サービス空間寸法とする。
3）取付用ネジはトラスタッピンネジ呼び径5×20を使用のこと。

NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE TAPPING SCREWS ø5x20 FOR FIXING THE UNIT.

DRAWN 27/Apr/2012 T.YAMASAKI		TITLE	CV-288
CHECKED 27/Apr/2012 H.MAKI		名称	指示器
APPROVED 27/Apr/2012 Y.NISHIYAMA	FCV-288		外寸図
SCALE 1/5 MASS 5.5 ±10% kg		NAME	DISPLAY UNIT
DWG.No. C2383-G01- C	REF.No. 02-166-100G-3		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO



注記
＊１）造船所手配。
＊２）オプション。

NOTE
*1: SHIPYARD SUPPLY.
*2: OPTION.

DRAWN 7/Jan/2015 T.YAMASAKI		TITLE	FCV-288
CHECKED 7/Jan/2015 H.MAKI		名 称	カラーLCD魚探
APPROVED 8/Jan/2015 H.MAKI			相互結線図
SCALE / MASS kg		NAME	COLOR LCD FISH FINDER
DWG.No. C2383-C01- F	REF.No. 02-166-1201-2		INTERCONNECTION DIAGRAM

S-1

FURUNO ELECTRIC CO., LTD.

INDEX

FURUNO ELECTRIC CO., LTD.
9-52 Ashihara-cho, Nishinomiya, 662-8580, Japan
Tel: +81 (798) 65-2111 Fax: +81 (798) 65-1020
www.furuno.com

Publication No. DOCQA1048

EC Declaration of Conformity

CE

We FURUNO ELECTRIC CO., LTD.

(Manufacturer)

9-52 Ashihara-Cho, Nishinomiya City, 662-8580, Hyogo, Japan

(Address)

declare under our sole responsibility that the product

COLOR LCD FISH FINDER FCV-288

(Model name, type number)

to which this declaration relates is in conformity with the following standard(s) or other normative document(s)

IEC 60945 Ed.4.0: 2002 incl. Corr. 1: 2008
IEC 60945 Ed.3.0: 1996, clauses 10.2 and 10.3

(title and/or number and date of issue of the standard(s) or other normative document(s))

For assessment, see

- Test Report FLI 12-12-058, April 27, 2012 prepared by Furuno Labotech International Co., Ltd.

This declaration is issued according to the Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.

On behalf of Furuno Electric Co., Ltd.

Nishinomiya City, Japan
May 17, 2016

(Place and date of issue)

Yoshitaka Shogaki
Department General Manager
Quality Assurance Department

(name and signature or equivalent marking of authorized person)