# FURUNO

# OPERATOR'S MANUAL

## WIRED TRAWL SONAR

MODEL    TS-331A

® FURUNO ELECTRIC CO., LTD.

NISHINOMIYA, JAPAN

**ECF**
**(Elemental Chlorine Free)**
The paper used in this manual
is elemental chlorine free.

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( DAMI ) TS-331A

Your Local Agent/Dealer

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*OME13210A00*

# ⚠ **SAFETY INSTRUCTIONS**

## ⚠ **WARNING**

**ELECTRICAL SHOCK HAZARD**
**Do not open the surface processor unit.**

Only qualified personnel should work inside the equipment.

**Do not disassemble or modify the equipment.**

Fire, electrical shock or serious injury can result.

**Immediately turn off the power at the switchboard if water leaks into the surface processor unit.**

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

**Install batteries in the catch sensor with correct polarity.**

Improper polarity or size may cause the batteries to explode.

## ⚠ **WARNING**

**Do not place liquid-filled containers on the top of the surface processor unit.**

Fire or electrical shock can result if a liquid spills into the unit.

**Immediately turn off the power at the switchboard if the surface processor unit is emitting smoke or fire.**

Continued use can cause fatal damage to the equipment. Contact a FURUNO agent for service.

**Make sure no rain or water splash leaks into the surface processor unit.**

Fire or electrical shock can result if water leaks in the unit.
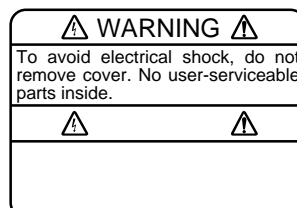
**Use the proper fuse.**

Use of a wrong fuse can result in damage to the equipment or cause fire.

**Use the proper battery in the surface processor unit.**

The mother board in the surface processor unit has a battery which stores settings when the power is off. Use the correct battery and install it properly to prevent explosion of the battery.

### Warning Label

**A warning label is attached to the surface processor unit. Do not remove the label. If the label is missing or damaged, contact a FURUNO agent or dealer about replacement.**

| ⚠ WARNING ⚠ |
| --- |
| To avoid electrical shock, do not remove cover. No user-serviceable parts inside. |
| ⚠                          ⚠ |
| |

Name: Warning Label (1)
Type: 86-003-1011-1
Code No.: 100-236-231

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# FOREWORD

## Introduction

FURUNO Electric Company thanks you for considering and purchasing the TS-331A Wired Trawl Sonar. We are confident you will discover why the FURUNO name has become synonymous with quality and reliability.

The TS-331A is a wired trawl monitoring system designed to improve control and efficiency in pelagic and semi-bottom trawling. Mainly consisting of an Underwater Unit, a Surface Processor Unit and a Mouse, the TS-331A presents data received from a trawl-mounted transducer on high quality and low-noise images.

No machine can perform to the utmost of its ability unless properly installed, maintained and operated. Please read and follow the recommended procedures for operation and maintenance to get the most out of the equipment.

## Features

The TS-331A is a third wire, head rope mounted system incorporating a high resolution scanning sonar designed especially for monitoring the opening of the trawl net and surrounding areas. Also included are depth and temperature sensors, a 120kHz downward looking echo sounder, four catch indicators, and a pitch and roll indicator for monitoring the attitude of the trawl unit. The trawl unit is connected to the Surface Processor Unit by a 2-conductor cable. This cable provides 130 VDC power to the trawl unit as well as two-way communications.

Some of the main features are

- High resolution net profile

- Graphic presentation of net attitude

- Three display modes: polar (0°-360°), locked (echo sounder) and sector (0°-180°)

- Four catch sensors (option) may be mounted on the codend to monitor catch.

## Notice

- No part of this manual may be copied or reproduced without written permission.

- If this manual is lost or worn, contact your dealer about replacement.

- The contents of this manual and equipment specifications are subject to change without notice.

- The example screens (or illustrations) shown in this manual may not match the screens you see on your display. The screen you see depends on your system configuration and equipment settings.

- This manual is intended for use by native speakers of English.

- FURUNO will assume no responsibility for the damage caused by improper use or modification of the equipment or claims of loss of profit by a third party.

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# SYSTEM CONFIGURATION

PC Monitor
(User supply)

Power
source

100-240VAC
1$\phi$, 50-60 Hz — Surface Processor Unit

Mouse

Keyboard

Winch

Cable Block

Underwater Unit

——— : Standard supply
·········· : Optional supply
– – – – : Local, user supply

Catch Sensor (option)
(4 max.)

*System configuration*

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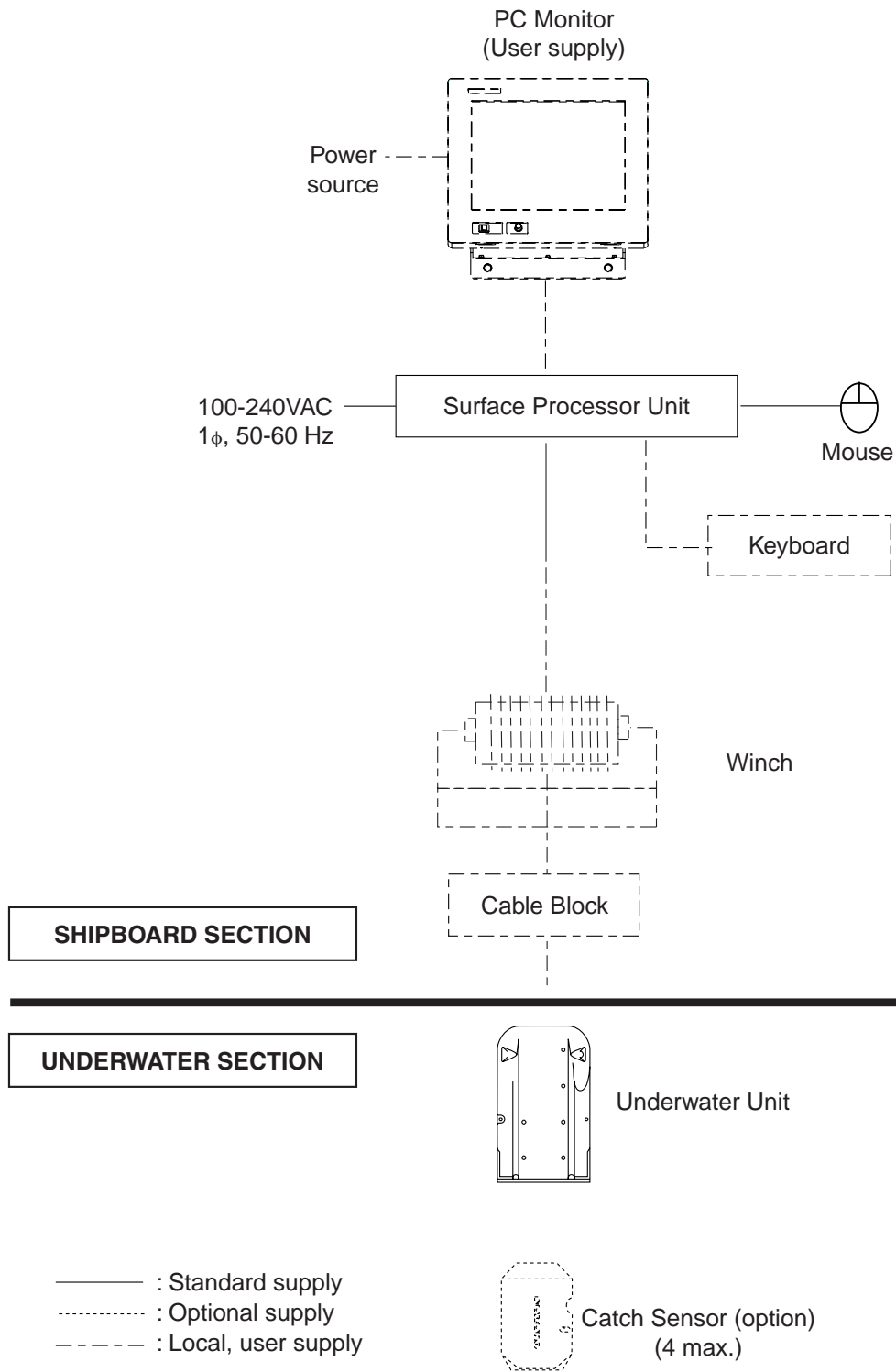
# OPERATIONAL INFORMATION

The following may occur during operation. Follow the recommended procedure to restore normal operation.

## Cannot restore unit of temperature measurement to Celsius

### Remedy

1. Choose Load Configuration from the File menu.
2. Find the file Default.cfg in the Imagenex program files and click Open.

If Fahrenheit is selected and Save Configuration is executed, the file Default.cfg will be overwritten, which will prevent changing of unit of temperature measurement. If this occurs, contact your dealer.

## "Application error" results when the range is changed in the Settings Dialog box after clicking the Pitch/Roll window

### Remedy

1. Click "Don't send" in the error message box at the bottom of the screen.
2. The application is quitted; click the TS331A icon to start up the application.

To change a sonar or echo sounder setting after application error occurs, first click the corresponding window or run the corresponding diagnostic, and then change the setting.

## "Application error" results when Total Length of Cod-End in the Catch Sensor Setup dialog box is set to zero (0)

### Remedy

1. Click "Don't send" in the error message box at the bottom of the screen.
2. The application is quitted; click the TS331A icon to start up the application.

Set the Total Length of Cod-End to a value larger than 1 to prevent application error.

*This page intentionally left blank.*

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# 1. OPERATIONAL OVERVIEW

## 1.1 Surface Processor Unit

The Surface Processor Unit (sometimes referred to as "Processor") has a built-in PC mother board, Windows XP$^{®}$* operating system, and a hard drive with at least 2GB disk space. The system provides a control and display application TS331A.exe (installed on the Processor), which is a very convenient tool for users to control system parameters such as acoustic operating range, scan speed, scan area, etc. It also displays real-time data such as depth/temperature, vertical sonar images, echo sounder images, pitch and roll, and catch sensor information on the screen in resizable windows.

The mouse connects at the rear of the Processor and functions to control the system, from various menus. Note that the system can also be controlled from a keyboard (local supply).



POWER Switch

Windows Startup Switch

*Surface processor unit*

*: Windows XP is a registered trademark of Microsoft, Inc.

## 1.2    Underwater Unit

### 1.2.1    Components of the underwater unit

The underwater unit mainly consists of a red polyurethane case and three transducers. The vertical sonar transducer is the cylindrical red housing which extends from the back of the case. The (gray) echo sounder transducer is mounted near the front of the unit. The catch sensor receiver transducer is located at the back of the unit, to the right of the vertical sonar transducer.
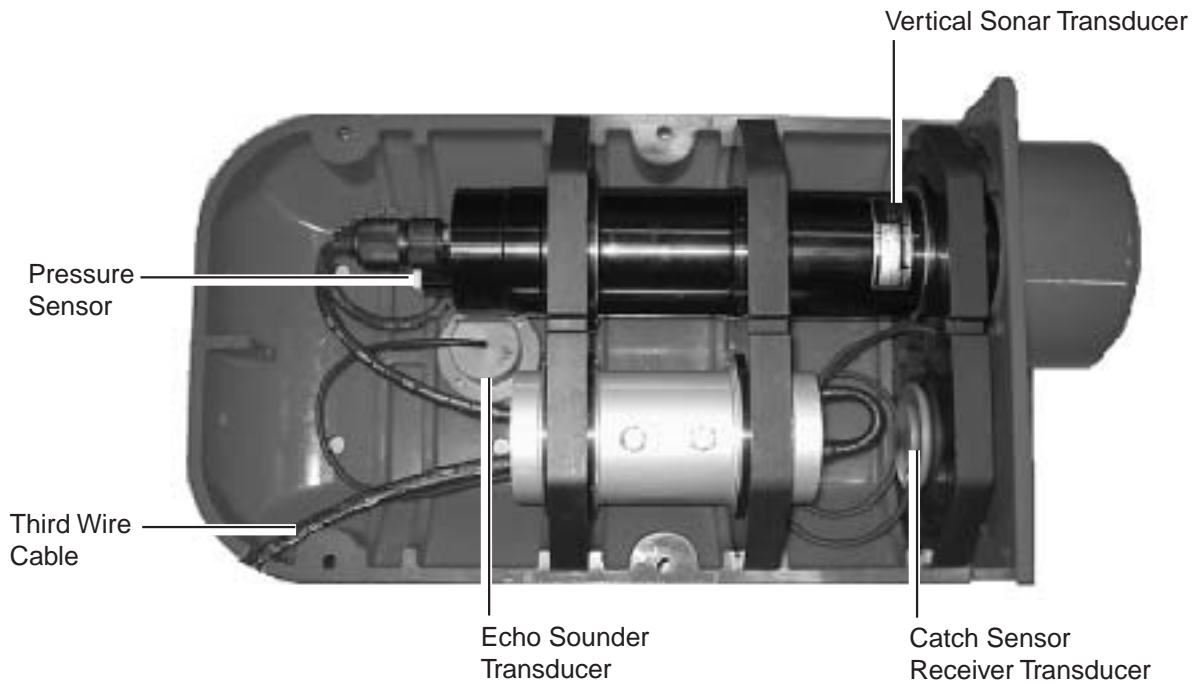


*Underwater unit, cover removed*

### 1.2.2    Trawl system



*Trawl system*

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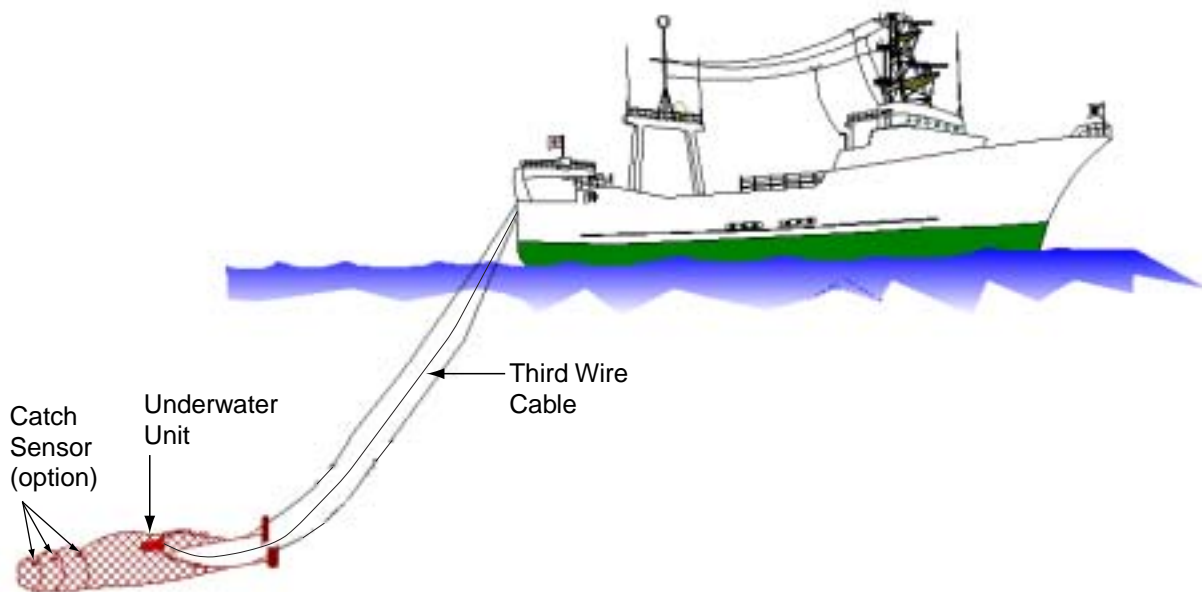
## 1.2.3    Mounting the underwater unit on the trawl

Usually the underwater unit is fixed either on the head rope of the trawl or on the belly just above the ground rope.

The advantage of the former position is that the underwater unit is held horizontal almost throughout the towing operation and consequently a good, stable image can be expected. Its disadvantage is that it is difficult to detect the ground rope, especially in bottom trawling since the ground rope in the bottom trawl becomes positioned farther back than the head rope. In mid-water and pelagic trawls, the ground rope usually becomes positioned below the head rope and hence the ground rope is easily detected with the underwater unit on the head rope.

The underwater unit is typically enclosed in a "pouch" made of fine mesh netting and attached to the head rope with ropes. The pouch is attached to a small mesh net (smaller trawlers) with ropes to stabilize the underwater unit. (Smaller trawlers may not require the small mesh net for stabilization.) The small mesh net is attached to the trawl with ropes.
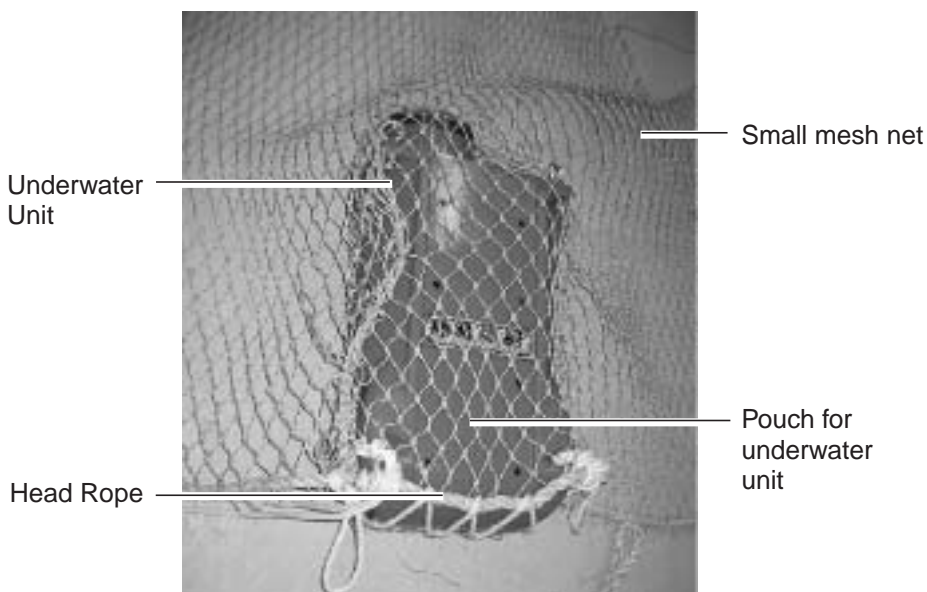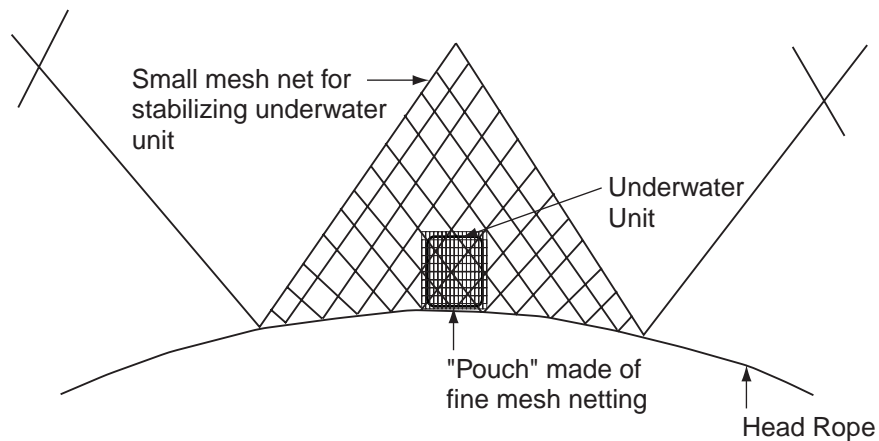




*Typical installation of underwater unit (for larger trawler)*

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# 1.3 Starting Up, Shutting Down

## 1.3.1 Starting up

1. Check the connection between the underwater unit and the winch.
2. Mount the underwater unit on the trawl, referring to paragraph 1.2.3.
3. Shoot the trawl.
4. Turn on the processor unit and the monitor. Adjust display brilliance referring to the owner's manual of the monitor.
5. Push the Windows Startup switch on the Processor to start up Windows$^®$. The system will start up loading the Windows$^®$ XP* operating system and then the TS331A program.

You can exit this application by clicking the "close window" button (X) at the upper right corner of the screen or use the menu command File->Exit.

When the power is turned on, the normal screen display should appear. Then, the sonar head calibrates itself by moving its transducer to the center or zero angle and waits for the "scan command" from the Processor. The head then scans based on the last-used settings of MODE, SECTOR, TRAIN and SPEED. If the message "No Communication" appears, check connections.

## 1.3.2 Shutting down

1. Since the Processor is running a Windows$^®$* operating system, before you turn off the Processor, shut down the computer first. Click Start->Turn Off Computer->Shut Down. Wait a few seconds until the system shuts down. Then, turn off the power of the Processor.
2. Turn off the monitor.
3. Haul the net.

*: Windows and Windows XP are registered trademarks of Microsoft, Inc.

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## 1.4 Catch Sensor CS-400 (option)

Mounted on the cod end of the trawl, the catch sensor monitors the catch of fish. Four catch sensors may be mounted. The data from each catch sensor is transmitted to the underwater unit via the acoustical link and sent to the Processor. Tx frequency for each sensor is selectable with an internal jumper block.

**The catch sensor is powered by three "D" alkaline batteries. If they have not been installed, see page 44 for how to install them.**

**Note:** If the unit will not be used for a long period of time, remove the batteries.

Lanyard (Secured to codend of net.)

LED

Acoustic transducer

Electrode

Polyurethane Housing

*Catch Sensor CS-400*

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# 1.5    Screen Layout

The fully configured TS-331A provides five viewing windows (Vertical sonar image, Depth/water temperature information, Echo sounder image, Catch sensor information, and Pitch/roll information) plus a Settings dialog box*.

* The Vertical Sonar Settings dialog box is initially shown.



① Menu bar
② Toolbar
③ Vertical sonar image
④ Pitch/roll information
⑤ Catch sensor information
⑥ Echo sounder image
⑦ Settings dialog box*
⑧ Depth/water temperature information

* Items available depend on active window. Items not available appear in gray.

*Screen layout*

**Note 1:** You can drag a window's border to resize the window to your desired size or drag the window's title bar to move the entire window.
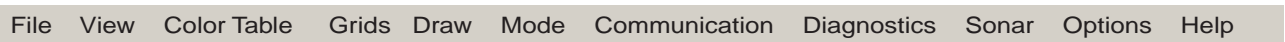
**Note 2:** Certain devices or sensors can be manually disabled by turning them off from the Options menu. See the figure below. The vertical sonar image cannot be disabled; it is always displayed.

These displays can be turned on or off.
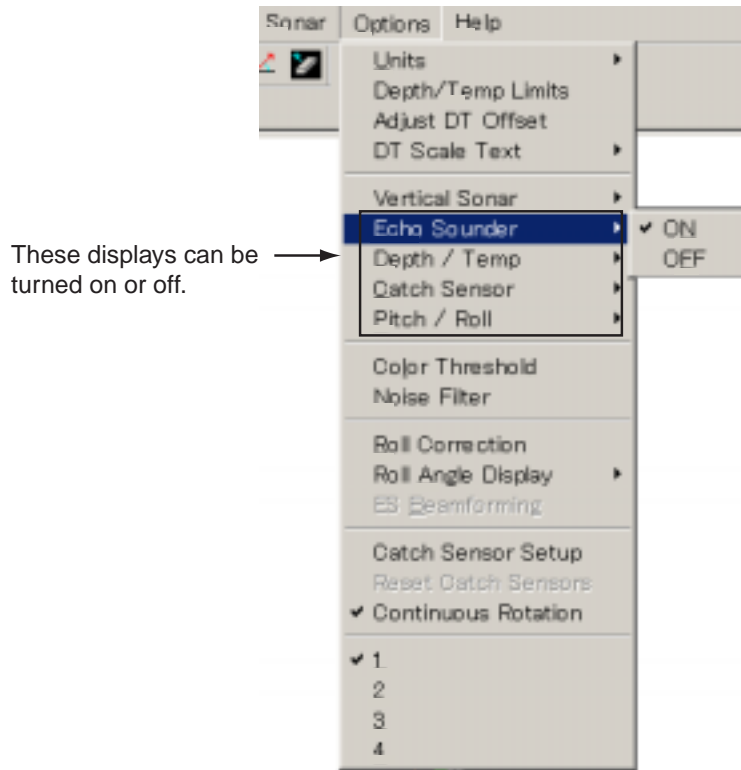


*Options menu, Echo Sounder selected*

## 1.5.1 Menu bar

The menu bar is the horizontal strip below the title bar at the top of the screen and it contains the titles of the TS-331A's drop-down menus. To open a menu, sub menu or choose an option, click it with the left mouse button. A sub menu which has an arrow (►) means it contains an options selection window, such as the Echo Sounder sub menu shown above.

| File | View | Color Table | Grids | Draw | Mode | Communication | Diagnostics | Sonar | Options | Help |
|------|------|-------------|-------|------|------|---------------|-------------|-------|---------|------|

*Menu bar*

## 1.5.2 Toolbars

The main toolbar and the draw toolbar are displayed across the top of the application window, below the menu bar in the normal display mode. The toolbars provide quick mouse access to many tools used in TS-331A program. To hide or display a toolbar, uncheck or check appropriate tool bar on the View menu.



Main toolbar                                          Draw toolbar
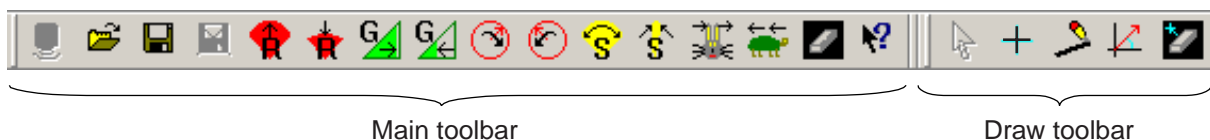
*Toolbars*

*Toolbar description*

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| Tool | Function |
|---|---|
| **Main Toolbar** | |
| | Connects to sonar head. |
| | Opens an existing .331 data file to play back. |
| | Saves real-time acquired sonar data to a .331 file. |
| | Stop saving real-time data. |
| | Increases operating range by one level. Vertical sonar range: 10, 20, 30, 40, 50, 60, 80, 100, 150, 200, 250 (meters) or equivalent feet/fathoms. Echo sounder range: 50, 100, 150, 200, 300 (meters) or equivalent feet/fathoms. |
| | Decreases operating range by one level. |
| | Increases data (display) gain by 1 per cent for vertical sonar and echo sounder. |
| | Decreases data (display) gain by 1 per cent for vertical sonar and echo sounder. |
| | Increases train angle by 10 degrees (vertical sonar only). |
| | Decreases train angle by 10 degrees (vertical sonar only). |
| | Increases sector size by 10 degrees (vertical sonar only). |
| | Decreases sector size by 10 degrees (vertical sonar only). |
| | Increases sonar scan speed (vertical sonar only). |
| | Decreases sonar scan speed (vertical sonar only). |
| | Clears the screen (vertical sonar, echo sounder, and depth/temp windows). |
| | Context sensitive help. |
| **Draw Toolbar** | |
| | Draws a line on the screen, with distance shown. |
| | Draws a line on the screen, with range and bearing shown. |
| | Deletes all lines and symbols drawn on the screen. |
| | Draws a "+" symbol on the screen at the current mouse position. |
| | Stops drawing objects on the screen. |

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# 1.6 Display Indications

Below are all the indications which appear on the display screen.



**Asterisk(blinking)**
Blinks when depth/water temp. data is received.

**Color indicator**

**Depth scale**

**Temp. scale**

FURUNO logo appears here.

**Sonar settings**
Range, gain, speed, mode, frequency

**Asterisk(blinking)**
Green: Receiving signal from under-water unit
Red: No signal

**Grid**
(Circular or square)

**Scale**

**Depth**
Bottom
Trawl
Cod End
Date, Time

**Catch sensor indicator**
Time figure is how long since sensor has been activated.
Color inside each section changes with catch sensor status.
Triggered: Red
Standby: Yellow
Sleep: Bkgd color

**Settings dialog box**
Item not available with active window is shown in gray.

**Active window indicator**
Color changes according to active window.
Med. blue : Sonar
Green : Depth/temp
Red : Echo sounder
Light blue : Catch sensor
Purple : Pitch/roll

**Echo sounder settings**
Range, gain

**Grid**

**Color indicator**

**Scale**

**Asterisk(blinking)**
Green: Receiving signal from echo sounder
Red: No signal

**Grid**

*1 Pitch and Roll Indicator
Analog and digital indications of net attitude at trawl and cod end.
*2 Nav data
Course, speed, trawl direction, trawl water speed, cod end water speed. Requires appropriate sensors.

*Indications*

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## 1.7 Pop-up Windows

The TS-331A provides convenient pop-up windows from which to conduct various operations for the vertical sonar window, echo sounder window, depth/temperature window, pitch/roll window and catch sensor window. To activate a pop-up window, place the cursor in the window corresponding to the pop-up menu you want to use and then click the screen with the right mouse button.

Vertical sonar
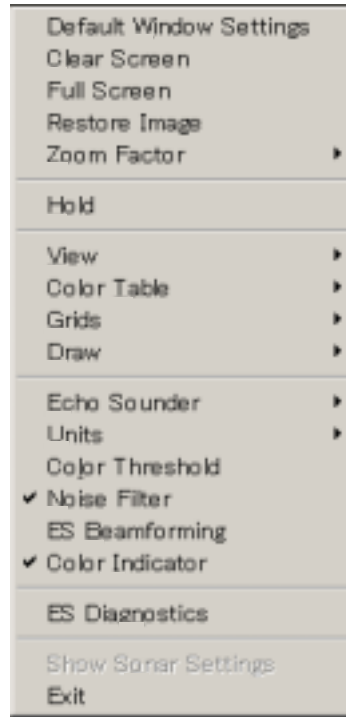
Echo sounder
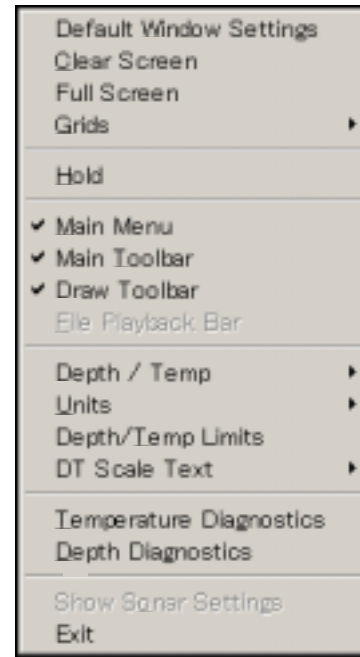
Depth/temperature
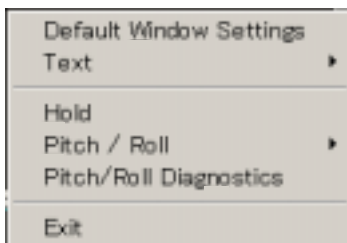
Pitch/roll
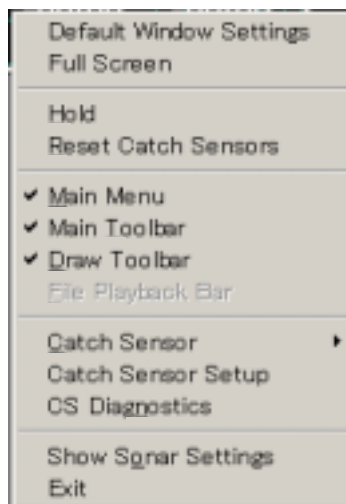
Catch sensor

*Pop-up windows*

# 2. SONAR OPERATION

## 2.1 Choosing a Sonar Mode

The TS-331A has three sonar display modes: polar, sector and locked. Choose desired mode from the Mode menu.

### 2.1.1 Polar mode

This mode is used for operating the sonar to scan a 360° area. The transducer location is in the middle of the sonar image display with the zero heading vertically down on the display.
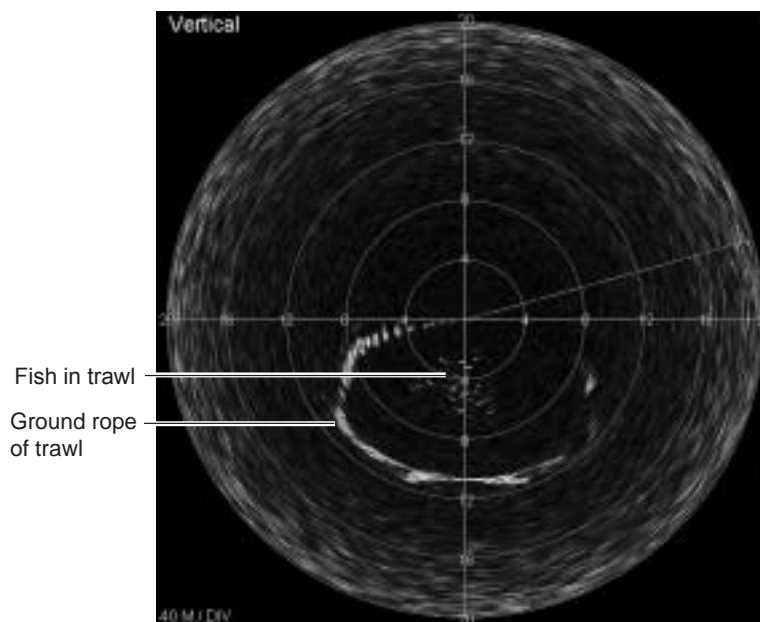


*Polar mode display*
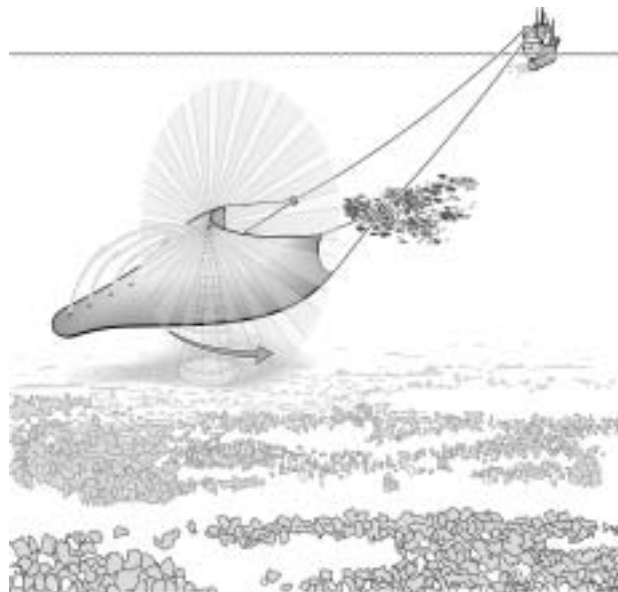


*Polar mode concept*

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## 2.1.2    Sector mode

This mode is used for operating the sonar to scan in a sector area. The transducer location is in the middle of the sonar image display with the zero heading vertically down on the display. The user can adjust the scan sector size by selecting the desired sector size from the Sector combo box in the Vertical Sonar settings dialog box. Sector size can be from 0° to 360° in 10° increments. The user can move the mid-point of the sector to any angle in 10° increments by selecting the desired train angle from the Train combo box in the vertical sonar settings dialog box. The user can use the Zoom Factor command in the View menu to enlarge or shrink sonar images and the mouse can be dragged to position the image where desired.



Fish in trawl

Ground rope of trawl
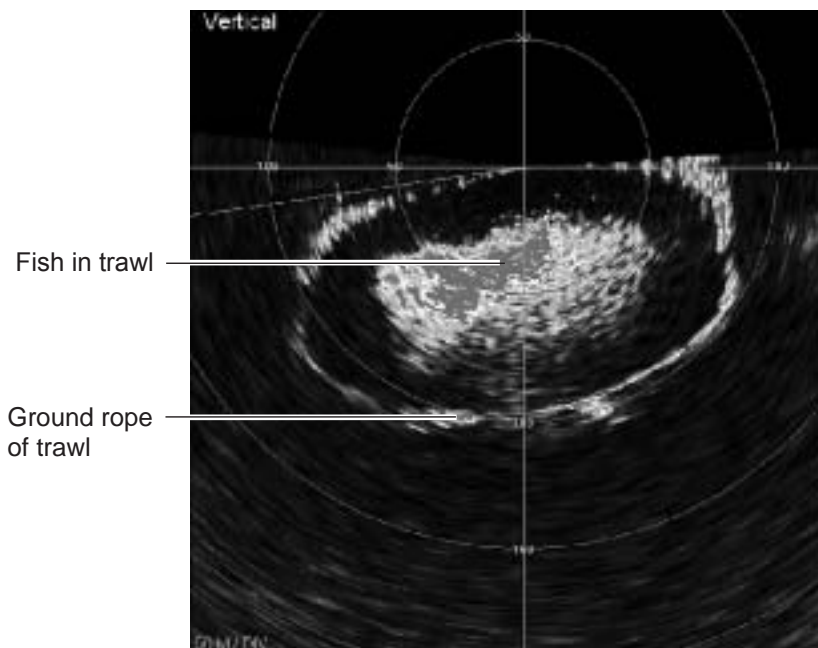
*Sector mode display*
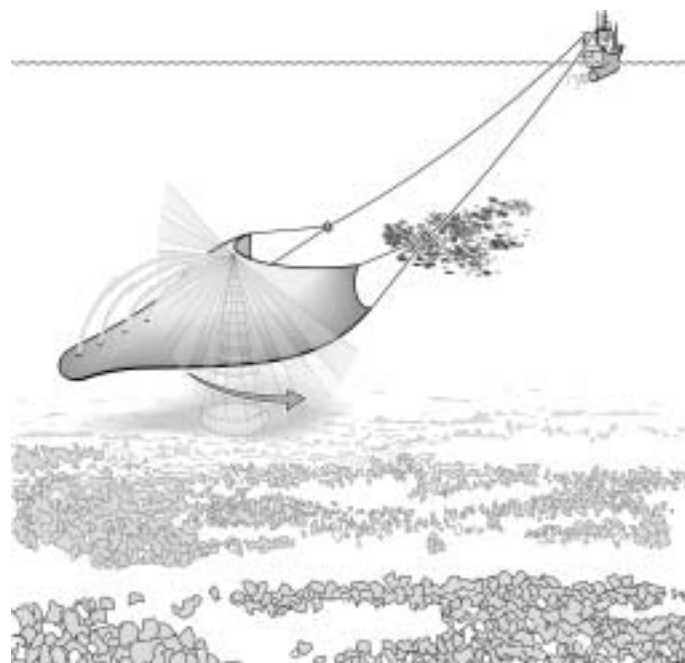


*Sector mode concept*

### 2.1.3 Locked mode

This mode functions to operate the sonar as an echo sounder, with the transducer locked at 0° sector size. The transducer location is at the top of the sonar image display and the image data is displayed across the screen from right to left.



Individual fish (angular echoes) in trawl

Ground rope of trawl

Bottom
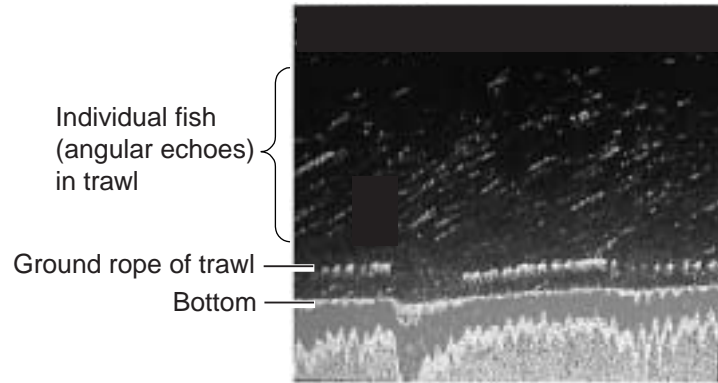
*Locked mode display*

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## 2.2 Adjusting the Sonar Image from the Vertical Sonar Settings Dialog Box

The vertical sonar settings dialog box contains all the controls for adjustment of the sonar image. To display this box if it is not displayed, click the sonar image with the left mouse button and then choose Show Sonar Settings from the View menu.



*Vertical sonar settings dialog box*

### 2.2.1 Choosing the display range

The Range combo box lets you choose desired display range, from the ranges shown in the table below.

*Ranges*

| Meters | Feet | Fathoms |
|:------:|:----:|:-------:|
| 250 | 750 | 125 |
| 200 | 600 | 100 |
| 150 | 450 | 75 |
| 100 | 300 | 50 |
| 80 | 240 | 40 |
| 60 | 180 | 30 |
| 50 | 150 | 25 |
| 40 | 120 | 20 |
| 30 | 90 | 15 |
| 20 | 60 | 10 |
| 10 | 30 | 5 |

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### 2.2.2  Adjusting gain

Adjust the gain from the Data Gain combo box. The gain range is 0-100(%). Data gain is used to increase or decrease the intensity (color levels) of the vertical sonar and sounder images.

### 2.2.3  Choosing train angle

Select the scan train angle from 0° to 360° in 10° increments. Train angle is used to control the relative direction of the mid point of the vertical sonar in the sector scan mode. Train is inoperative in the polar mode.

### 2.2.4  Choosing scan sector

Select the scan sector (from 0° to 360° in 10° increments). Sector is used to control the size of the angle scanned by the vertical sonar. Note that this function is inoperative in the polar and locked modes.

### 2.2.5  Choosing scanning speed

Select scan speed of vertical sonar. The options are

0.3 deg.: slow, one shot covers 0.3°
0.6 deg.: medium, one shot covers 0.6°
0.9 deg.: fast, one shot covers 0.9°
1.2 deg.: faster, one shot covers 1.2°
2.4 deg.: fastest, one shot covers 2.4°

### 2.2.6  Choosing sonar frequency

Choose the vertical sonar operating frequency for high or low.

### 2.2.7  Freezing the display

Click the **HOLD** button to freeze the system from interrogating sensors and freeze the data display. The sonar display shows "HELD" when the image is frozen. Click the button once again to release the freeze condition and restart the sonar. This feature is useful for inspecting an image, taking a picture of the display and printing.

### 2.2.8  Reversing the scan direction

Click the **REV** button to reverse the current scan direction of the vertical sonar. If the sonar is scanning clockwise, clicking the **REV** button will make the sonar scan counter clockwise and vice-versa. This is particularly useful when tracking moving targets.

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# 2.3    Monitoring Trawl Position

The Locked mode can be a valuable tool for monitoring trawl location in order to prevent damage to the trawl by shoal or other protrusion.

### Ground rope

If the ground rope is positioned in the coverage area of the sounding beam it is displayed as a line almost parallel with the transmission line. If a fish school appears between the transmission line and the ground rope it can be considered to be entering the trawl.

The interval between the transmission line and the ground rope is equivalent to the height of the trawl opening and therefore the interval is kept constant if the trawl is being properly towed. If it is unsteady, or if the ground rope rises suddenly, towards the transmission line, the trawl may be caught on some object.

### Image and fishing operations

The illustration and descriptions below show the relation between trawl and the LOCKED mode image in bottom trawling.
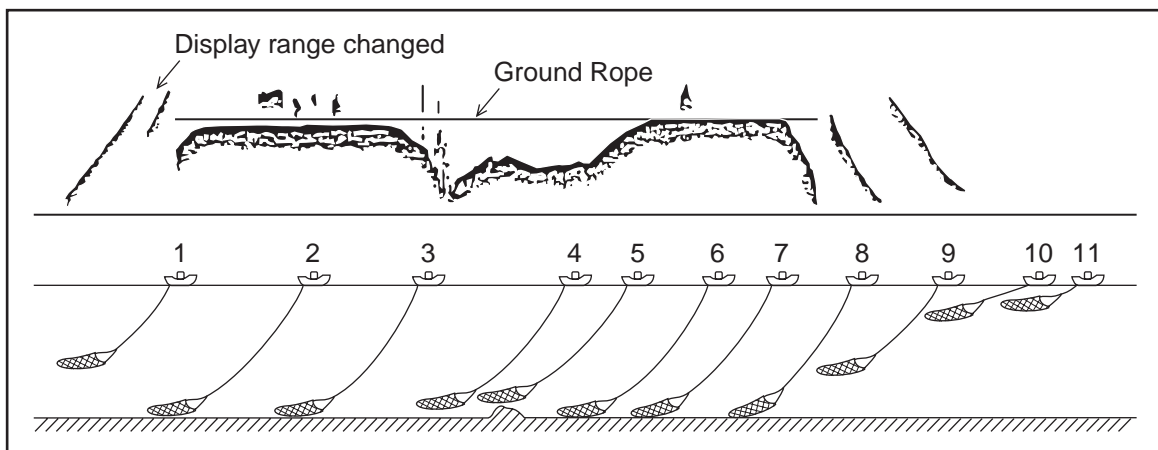


*Example fishing operation and echo sounder image*

1. The trawl is set into water and begins descending. In the image, the distance between the transducer and the bottom gets shorter and shorter as if the bottom is rising toward the transmitter unit. On the other hand, the distance between the transducer and the sea surface increases as if the sea surface is receding from the transducer. The range has been changed twice for shorter ranges.

2. The trawl has settled on the bottom.

3. The trawl is being towed along the bottom. Fish entering the trawl are seen above the ground rope. The ground rope is being kept at a constant distance from the transducer, indicating that the trawl mouth is opening properly in the course of towing.

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4.  The ship has accelerated to clear a shoal. The trawl is rising off the bottom and the bottom is displayed as if it has a sharp undulation though it actually does not.

5.  The trawl is passing over the shoal. The ground rope seen off the bottom indicates that the shoal has been cleared.

6.  The trawl has settled on the bottom again.

7.  The trawl is being towed along the bottom.

8.  Hauling of the trawl has begun.

9, 10.As the hauling proceeds, the bottom echoes are becoming distant and the sea surface echoes are getting nearer to the transmission line.

11. Hauling is completed.

# 2.4 Drawing Lines and Symbols

Using the draw tool bar or the Draw menu, you can draw lines and symbols on the sonar display (to mark important echoes). This can be done from the Draw menu or with the Draw toolbar.

## 2.4.1 Drawing a symbol

Choose Symbol from the Draw menu or click the [+] button on the draw toolbar. Roll the mouse to position the cursor in the sonar display and click the left mouse button. The symbol ("+") is placed at the cursor intersection. Repeat the above procedure to draw another symbol.
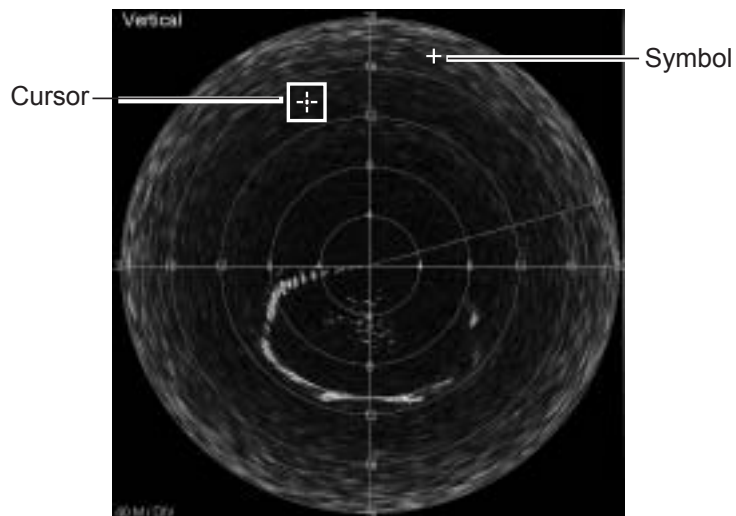


*Appearance of symbol on the display*

## 2.4.2 Drawing a line

Choose Line from the Draw menu or click the button on the draw toolbar. Roll the mouse to position the cursor on the starting point and click the left mouse button. Roll the mouse again to position the cursor on the end point and click the left mouse button. The distance between the points is shown at the end point. Repeat the above procedure to draw another line.
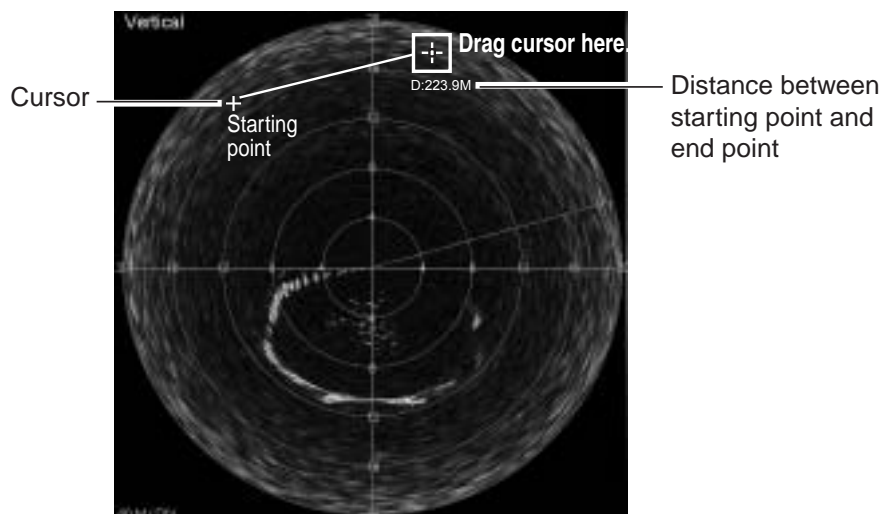


*Drawing a line on the display*

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### 2.4.3    Choosing line/symbol color

The default line/symbol color is white. However, you may choose line/symbol color as desired. Choose Line/Symbol Color from the Draw menu, and the dialog box shown below appears. Choose the desired color and then click the OK button.
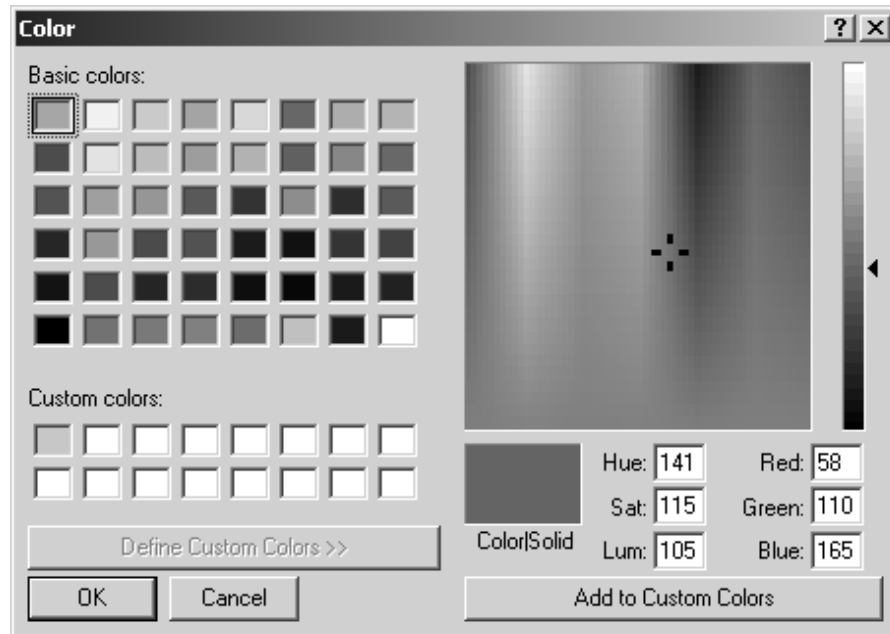
*Color dialog box*

### 2.4.4    Clearing line/symbol art

#### Clearing all symbols

Place the cursor on a symbol and then double-click the left mouse button.

#### Clearing a line

Place the cursor on the ending point of the line you wish to erase and then double-click the left mouse button.

#### Clearing all symbol/line art

Choose Clear line Art from the Draw menu.

#### Stopping drawing

The Stop Drawing command in the Draw menu is used to quit any drawings.

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## 2.5 Finding Range and Bearing from Own Ship to a Point

Choose Range / Bearing from the Draw menu or click the ⊞ button on the draw toolbar. Roll the mouse to position the cursor where you want to measure the range and bearing and click the left mouse button. The range and bearing from own ship to the point is shown. To find the range and bearing between to other points, repeat the above procedure.

Range and bearing to point
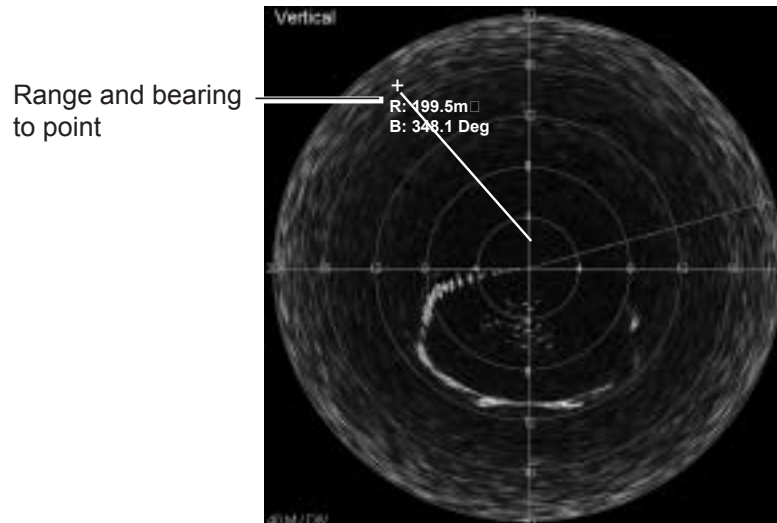


*Finding range and bearing from own ship to a point*

## 2.6 Zoom

Zoom Factor on the View menu lets you choose the zoom magnification, from 100, 125, 150, 175, 200, 300 and 400 (%).

## 2.7    Choosing Display Color

You may choose the color arrangement for the vertical sonar image. Open the Color Table menu and check color desired.

*Color Table menu*

**Color table menu description**

| | |
|---|---|
| **Normal High:** | This scale maps echo data amplitude to 118 colors, ranging from black (low strength) through blue, green, orange, yellow, white and red (highest strength). |
| **Normal Low:** | Same colors as Normal High but a lower color intensity |
| **Green:** | 118 shades of green. |
| **Grey:** | 118 shades of grey (white on black). |
| **Reverse Grey:** | 118 shades of grey (black on white). |
| **Brown/Yellow:** | 118 mixed shades of brown and yellow. |
| **Green/Blue:** | 118 mixed shades of green and blue. |
| **Green/Yellow:** | 118 mixed shades of green and yellow. |
| **Blue:** | 118 shades of blue. |

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## 2.8    Grid

You may configure the grid on the vertical sonar display as desired from the
Grids menu.
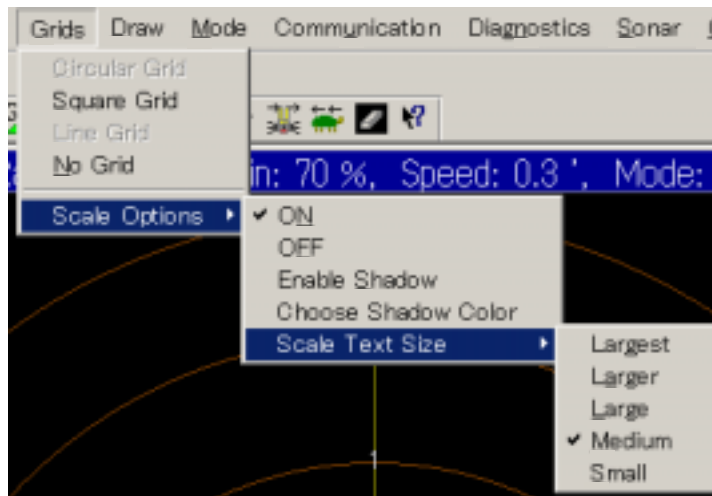


*Grids menu, Scale Options, Scale Text Size selected*

### Grids menu description

**Circular grid:**    Check to display a circular grid.
**Square grid:**    Displays a square grid.
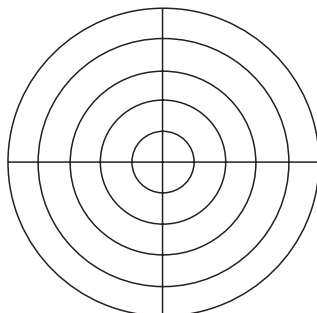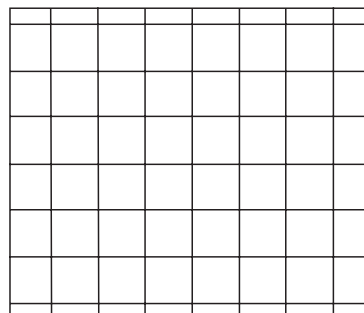


Circular grid                                Square grid

*Circular and square grids*

**No Grid:**        Check to turn off grid.
**Scale options:** Turns scale on or off, turns shadow behind scale on or off, and
                   chooses text scale text size.
                   **Enable Shadow:** Check to enable shadowing behind scale.
                   **Choose Shadow Color:** Click to display color dialog box to
                   choose color of shadow.
                   **Scale Text Size:** Choose text size from small, medium, large,
                   larger and largest.

## 2.9  Unit of Depth, Range Measurement

The unit of depth/range measurement may be chosen from meters, feet and fathoms, on the Options menu. Check the unit desired.
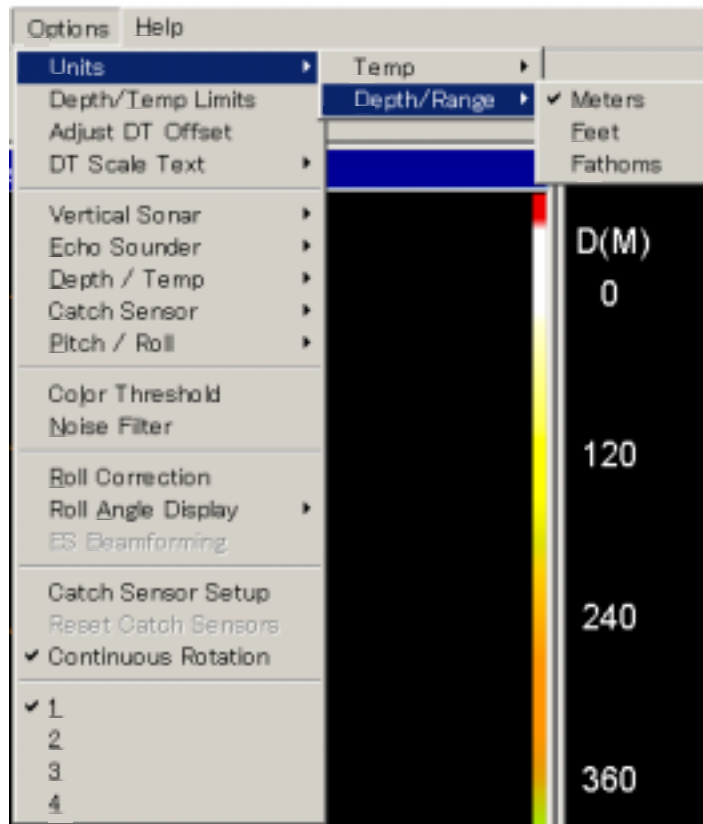


*Options menu, Units, Depth/Range selected*

## 2.10  Noise Filter

You may encounter occasional or intermittent noise and interference on the vertical sonar display or echo sounder display. Noise is mostly caused by electrical equipment engine or propeller noise from own ship or noise from other sonars being operated nearby. To suppress this noise, check Noise Filter on the Options menu. Uncheck it if no noise is present.

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## 2.11    Recording Sonar Data

You may save real-time data to a file. To save real-time data, do the following:

1.  Choose Record Sonar Data from the File menu. The Save as dialog box appears.
2.  Choose location where to save the file and enter file name.
3.  Click the Save button to save the data.

The TS-331A automatically adds the extension ".331". The equipment will continue interrogating the sonar unit for data while at the same time recording those data to a file.

**To stop recording sonar data,** choose Stop Data Recording from the File menu.

## 2.12    Playing Back Sonar Data

You can also use the TS-331A.exe program to playback data that has been recorded to a file (with file extension .331).

To open a .331 data file to playback, select "File->Open File to Playback" or click the Toolbar button  . When the program is running in file playback mode, the frame window will show a File Playback dialog bar. You can drag and dock it to a convenient place on the screen. This dialog bar lets you control the playback speed and playback file position.



*File progress indicator, playback speed selector*

**File Progress:** A slider bar with the pointer showing file playback position similar to the slider bar on the property page. Dragging the pointer to a new position will cause the file playback to start at that position. The slider range represents the file size.

Since the playback speed is fast, sometimes it is difficult to catch the right pointer position, because the pointer re-draws its position every time after a file record is processed. It is better to set the file playback on hold before you drag or click the slider bar.

**Play Back Speed:** Pressing the spin button up or down will change the playback speed faster or slower. The speed change will show in the speed progress bar.

Once a sonar data file has been opened, the operation of real-time sonar data acquisition will terminate. Although only one sonar data file may be opened at a time, another data file may be opened, closing the current file.

You can once again change the operation to real time data interrogation by selecting "menu->File->Connect to Sonar Head" or clicking the Toolbar button  When the system begins acquiring data from the sonar head, the current data file will be closed.

The TS-331A program provides several convenient methods (menu commands, dialog boxes, and toolbar commands) to control the sonar unit's operations, operating parameters and data display windows.

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# 2.13  Saving, Loading System Configuration

## 2.13.1  Saving system configuration

You may save sonar settings, window layouts and sensor status to a configuration file (file extension .cfg). You may then load the settings into the system. This is convenient for setting up the equipment according to fishing ground, targeted fish, etc.

To do this choose Save Configuration from the File menu. Name your file and click the Save button.

## 2.13.2  Loading system configuration

Choose Load Configuration from the File menu to load a configuration file into the system. Choose your file and then click the Save button.

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# 3. ECHO SOUNDER OPERATION

## 3.1 Echo Sounder Image

The echo sounder image is displayed in the echo sounder window at the right side of the screen.
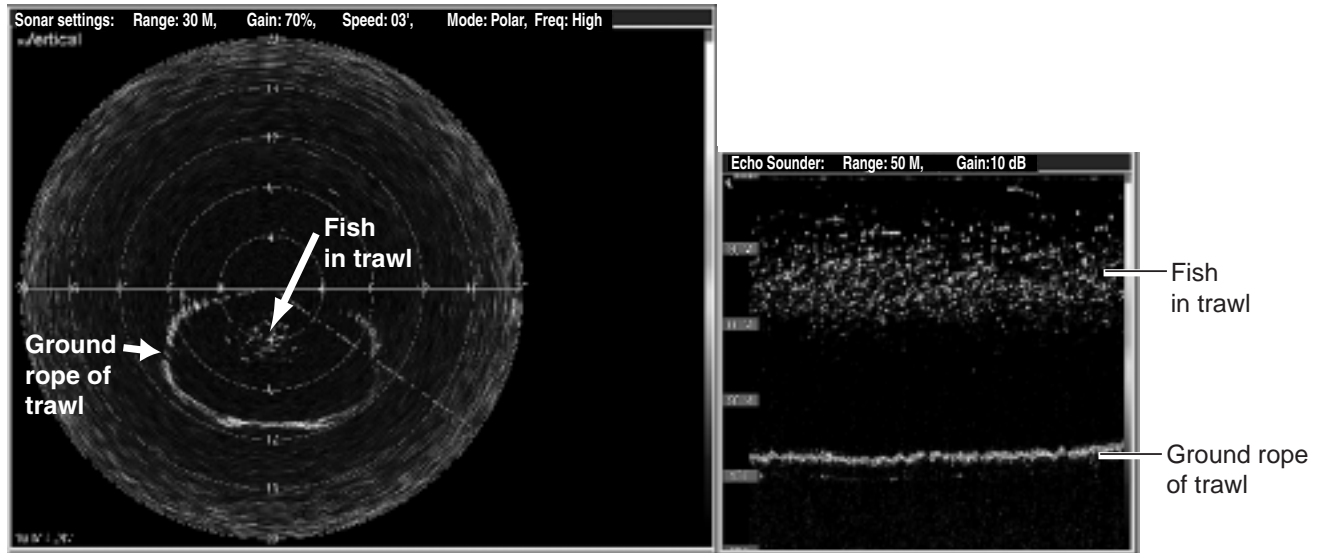


VERTICAL SONAR IMAGE                    ECHO SOUNDER IMAGE

*Vertical sonar and echo sounder images*

## 3.2 Adjusting the Echo Sounder Image from the Sounder Settings Dialog Box

The echo sounder settings dialog box contains all the controls for adjustment of the echo sounder image. To display this box, click the echo sounder image with the left mouse button and then choose Show Sonar Settings from the View menu.



*Echo sounder settings dialog box*

### 3.2.1 Choosing the display range

The Range combo box lets you choose desired display range, from 50, 100, 150, 200, 250 and 300 (meters) or equivalent feet/fathoms.

### 3.2.2 Adjusting data gain

Adjust the gain from the Data Gain combo box. The gain range is 0-100(%). Data gain is used to increase or decrease the intensity (color levels) of the vertical sonar and sounder images, collectively.

### 3.2.3 Adjusting echo sounder gain

Choose the ES Gain combo to adjust the gain of the connected echo sounder. The gain can be adjusted from 0dB to 20dB in 1 dB increments.

### 3.2.4 Freezing the display

Click the **HOLD** button to freeze the system from interrogating sensors and freeze the data display. The echo sounder display shows "HELD" when the image is frozen. Click the button once again to release the freeze condition and restart the echo sounder. This feature is useful for inspecting an image or taking a picture of the display.

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## 3.3 Using the Echo Sounder Image to Monitor Trawl Location

If the ground rope is positioned in the coverage area of the sounding beam it is displayed as a line almost parallel with the transmission line. If a fish school appears between the transmission line and the ground rope it can be considered to be entering the trawl.
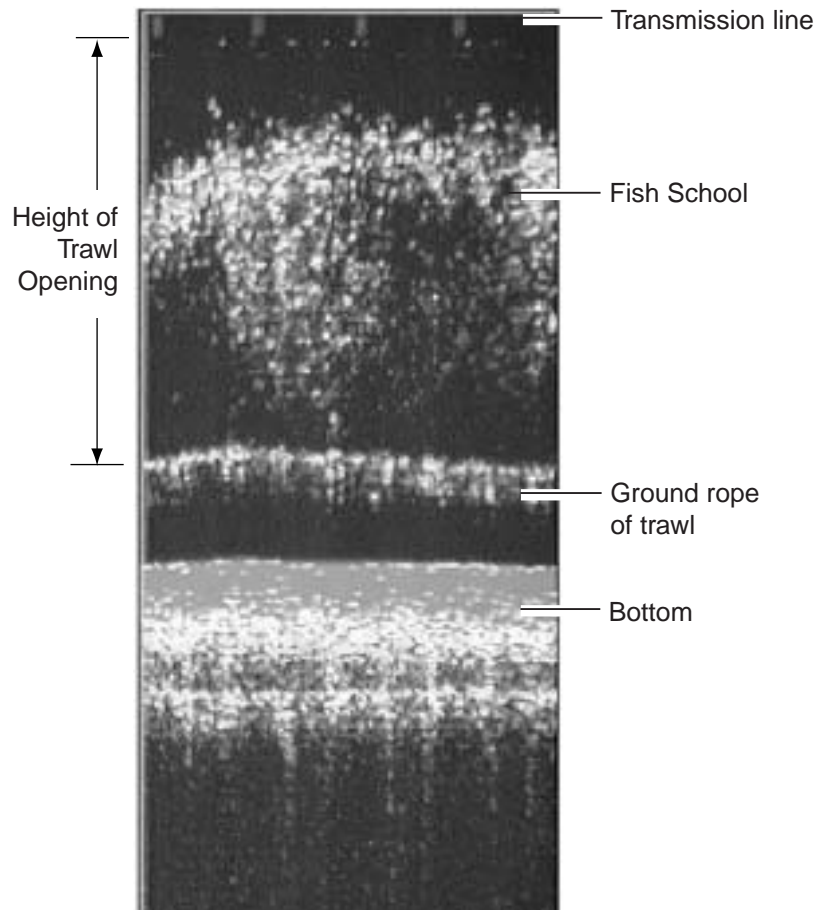


*Echo sounder display*

## 3.4    Drawing Lines and Symbols

The procedure for drawing lines and symbols on the echo sounder is similar to that for the sonar display. For details, see paragraph 2.4.

## 3.5    Grid

You may display a line grid on the echo sounder display. Check Line Grid on the Grids menu to display the grid.
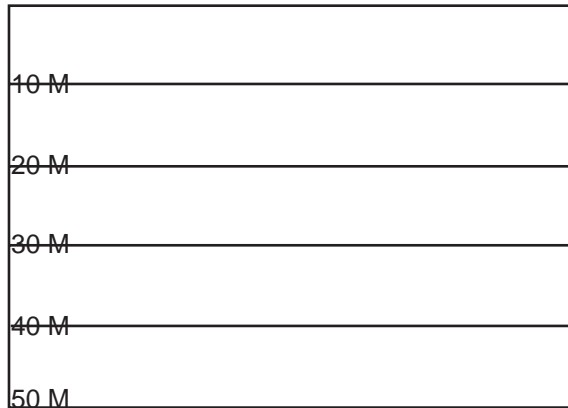


*Line grid*

## 3.6    Zoom

Zoom Factor on the View menu lets you choose the zoom magnification, from 100, 125, 150, 175, 200, 300, and 400 (%).

## 3.7    Colors

You may choose the color arrangement for the echo sounder. Open the Color Table menu and check color desired. For details, see page 21.

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# 4. DEPTH/TEMPERATURE DISPLAY

The depth and water temperature display graphs depth and water temperature, from right to left across the screen. This display uses a 3-second interrogation timer to determine when to ask the underwater unit for information. When this timer expires, the current interrogation is completed and the next two interrogations will be for the temperature and depth. Thus, the number of minutes of data shown depends on many factors including operating range, and which sensors are active when the timer expires.
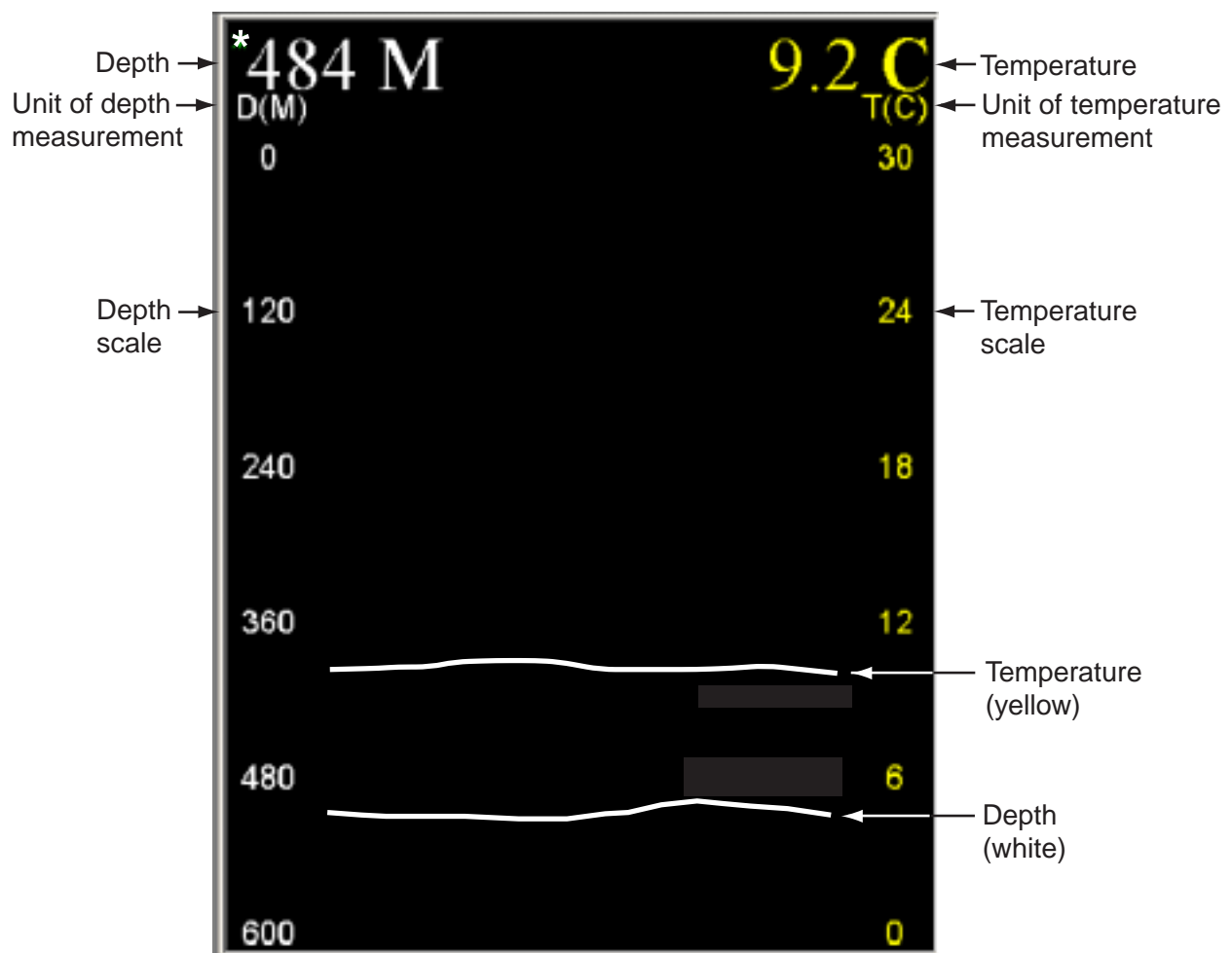


*Depth/Temperature display*

## 4.1 Unit of Temperature, Depth Measurement

You may choose the unit of temperature measurement from Fahrenheit or Celsius and unit of depth measurement among meters, feet or fathoms. This can be done with Units-Temp and Units-Depth/Range on the Options menu.

## 4.2    Setting Depth/Temperature Limits

You may set the depth and temperature display limits with Depth/Temp Limits on the Options menu. Set low and high limits with the spin buttons and then click the OK button.
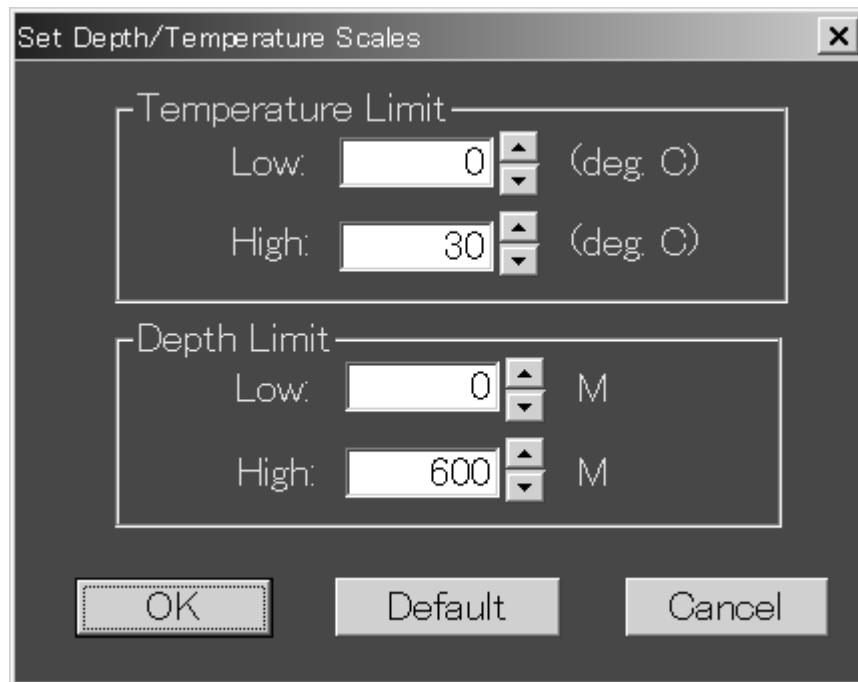


*Set Depth/Temperature Scales dialog box*

## 4.3    Depth/Temperature Offset

If the depth and/or temperature readout is incorrect you may enter an offset to correct it(them). Choose DT Offset from the Options menu to show the Depth/Temp Offset dialog box. Enter the appropriate offset with the spin buttons and then press the OK button. To remove the offsets, click the Reset button.



*Depth/Temp Offset dialog box*

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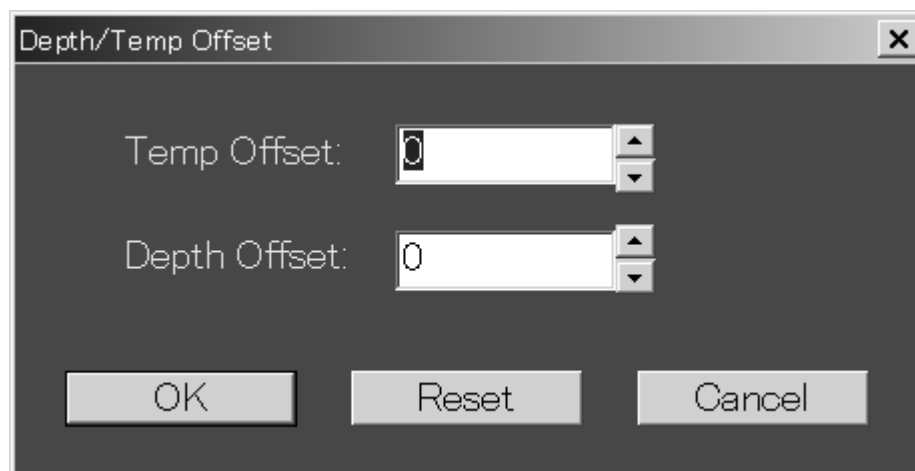
## 4.4 Depth/Temperature Scale Text Size

You may choose the size of the depth/temperature scale text with DT Scale Text on the Options menu.
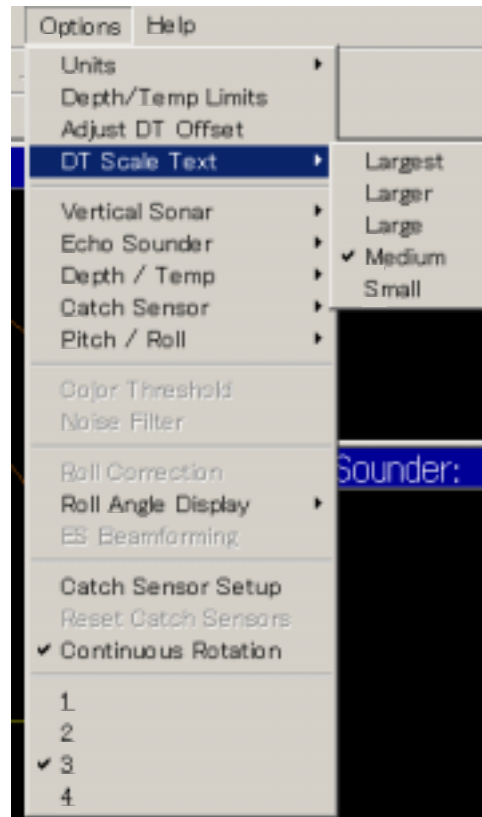


*Options menu, DT Scale Text selected*

## 4. DEPTH/TEMPERATURE DISPLAY

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# 5. MENU DESCRIPTION

This chapter provides menu information not discussed in previous chapters.

## 5.1 File Menu

**Connect to Sonar head**
Use this command to communicate with the TS331A underwater unit. The control software begins to interrogate the sonar unit for data in real-time through an RS-232 connection. The system uses COM2 as the default serial port for communications between the analog interface board and surface control system.

**Print**
Prints an image of the currently selected window.

**Print Preview**
Displays the currently selected window on the screen, as it would appear printed.

**Print Setup**
Selects a printer and printer connection.

**Exit**
Use this command to terminate your TS-331A program. System will save your display layout, sonar settings and sensor enable/disable status to default.cfg file. The next time you start the program, the system will load these default settings.

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# 5.2    View Menu

**Clear Screen**     Use this command to clear the image in one of vertical sonar, echo sounder and DT (Depth/Temperature display windows. Which window contents will be cleared depends on which window is active. To activate a window (set it on focus), click on that window.

**Full Screen**     Use this command to toggle full-screen and normal display mode. Full screen display mode hides the main menu, main toolbar, draw toolbar, and title bar to make more room for display windows.

Since full screen mode hides command menus and toolbars, if you need to issue a command, you can use the context popup menu, which has the same commands as in the main menu. Right clicking the mouse button in any window will display the context popup menu.

You can use menu->view->main menu (in context popup menu) to show the main menu and use menu->view->main toolbar to show the main toolbar.

**Restore Image**     Use this command to restore the vertical sonar or echo sounder image. When you move the image by clicking and dragging (or zooming) the image, the image may not be seen in the viewing window. Use this command to restore the image to its original size and position.

**Color Indicator**     Use this command to display and hide the color table indicator bar, which displays the color table used to represent echo strength. If enabled, this color table bar is displayed on the right side of the vertical sonar and echo sounder windows. The upper level colors represent higher echo strength, and lower level colors represent lower echo strength. A check mark appears next to the menu item when color table indicator bar is displayed.

Use the menu command Color Table to choose your preferred colors to display the sonar image.

**Scan Direction**     Use this command to display and hide the scan direction line on the vertical sonar window. This dotted yellow line represents the vertical sonar shooting direction. A check mark appears next to the menu item when scan direction line is displayed.

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# 5.3　Communication Menu

**Choose Sonar Com Port**　Choose another serial communication port for sonar data acquisition. Choose desired port from the combo box and click the OK button.
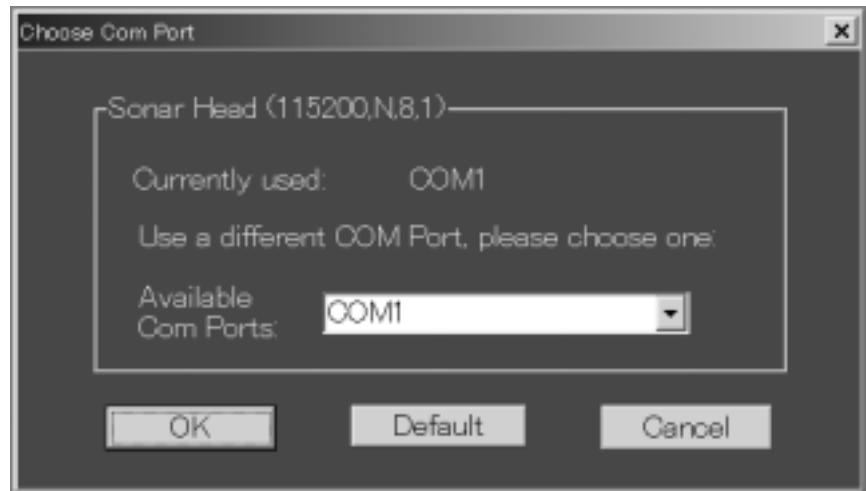


**GPS Data-In**　No use.

**Data-Out**　No use.

# 5.4　Sonar Menu

**BowScan**　Sets TS-331A.exe to Bowscan mode. All sensors are disabled except vertical sonar.

**TS-331A**　Sets TS-331A.exe to TS-331A mode. All sensors are functional.

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# 5.5    Options Menu

**Color Threshold**

The Color Threshold dialog box allows the user to adjust the color table for the echo sounder and vertical sonar windows individually. Note that the sonar return data is not compromised and is recorded to file independent of the color thresholding. Thus on file playback, the threshold may be altered according to need.

**Detection Threshold:** This adjusts the point at which data is displayed. All sonar data values below the detection threshold show as black.
**Saturation Threshold:** This adjusts the point at which data is displayed as red. All sonar data values above the saturation threshold show as red.

Data Value < Detection Threshold = Display as Black

Detection Threshold < Data Value < Saturation Threshold

$$Datavalue = \frac{Datavalue * 107}{Saturation\ Threshold}$$

Data Value > Saturation Threshold = Display as Red
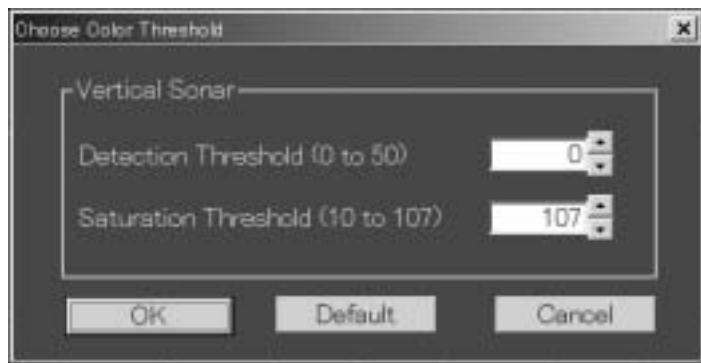


**Roll Correction**

Enable/disable roll correction. If enabled, vertical sonar image display will compensate the roll offset.

**Roll Angle Display->ON**

Display a dashed line indicating the roll angle relative to the vertical sonar image.

**Roll Angle Display->OFF**

Hide the dashed line indicating the roll angle.

**Echo Sounder Beamforming**

Apply a beam-forming technique to the echo sounder display.

**Continuous Rotation**

The vertical sonar can scan continuously in one direction (clockwise or counter clockwise).

**1, 2, 3, 4**

Choose active window/dialog box. 1, Vertical sonar window; 2, Settings dialog box; 3, Echo sounder window, 4, Catch sensor window.

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# 5.6    Help Menu

The Help menu offers the following commands, which provide you assistance with this
application:

**Help Topics**                  Provides a list of help topics.

**Help Contents**                Offers you a list of contents on which you can get help.

                                 Use this command to display the opening screen of Help. From
                                 the opening screen, you can jump to step-by-step instructions for
                                 using TS-331A and various types of reference information.

**About**                        Use this command to display the copyright notice and version
                                 number of your copy of TS-331A as well as contact information.

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5. MENU DESCRIPTION

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# 6. CATCH SENSOR OPERATION

## 6.1 Catch Sensor Dialog Box

The Catch Sensor Setup dialog box provides a tool for you to configure the catch sensors on a trawl net. You can install up to four catch sensors on the TS-331A system. TS-331A program default settings display four catch sensors. You can click the Delete button in this dialog box to remove catch sensor/sensors if less than 4 catch sensors are installed.
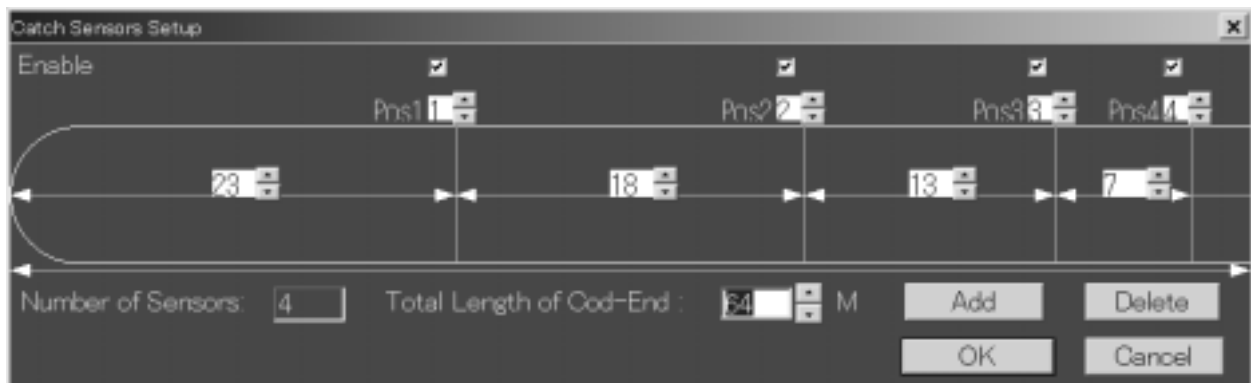


*Catch sensor setup dialog box*

The Catch Sensor Setup dialog box provides the following options:

***Enable catch sensor (check boxes)***

Checking/Unchecking the "Enable Catch Sensor" check box will enable/disable that particular catch sensor. There can be a maximum of four catch sensors installed at a time.

***Catch Sensor ID (edit boxes)***

The Catch Sensor ID is a number used to distinguish different catch sensors. Each sensor transmits an acoustic signal with its own fixed frequencies so the system knows which one is installed (received a standby signal) or triggered (received a triggered signal). TS-331A uses number 1 to 4 to distinguish them.

1:  69.75kHz/70.25kHz ±50Hz
2:  72.25kHz/72.75kHz ±50Hz
3:  74.75kHz/75.25kHz ±50Hz
4:  77.25kHz/77.75kHz ±50Hz

It is not required to install the sensor number 1 at the first position (Pos1), sensor number 2 at the Pos2, etc. You may install sensor number 1 at Pos4, for example. In this case, you need to input the right numbers of the sensor ID at the corresponding position.

### Catch Sensor relative position (edit boxes)

Input the relative length between two catch sensors in meters.

### Total Length of Cod-End

Input the total length of the trawl net in meters.

### Add (button)

Add another catch sensor (maximum of 4) in catch sensor display.

### Delete (button)

Delete one sensor.

After changes are made and accepted, by clicking the "OK" button, the catch sensor display will adjust to those changes.

## 6.2 Catch Sensor Window

The catch sensor window is located below the pitch/roll window and it indicates catch sensor status and sensor activation time.

The program has an internal timer which counts sensor activation time. If the trigger (indicated by showing red in a sensor status window) is present for two minutes, the timer starts counting. This two-minute gap between trigger presence and timer start is done to prevent false readings. After another minute has passed, the indicator will show "00:01" and will update once every minute. The timer continues to count even if the signal goes away (for example, the catch sensor points in wrong direction). This is shown on the catch sensor window by displaying a time, but no color (red or yellow) is seen in the catch window. You may reset the timer by left-clicking Reset Catch Sensors in the Options menu.

Catch sensor status
Color shows status.
Triggered: Red
Standby:   Yellow
Sleep:     Bkgd color

Catch sensor
activation time
(hr:mm)

00:00     00:00     00:00     00:00

*Catch sensor window*

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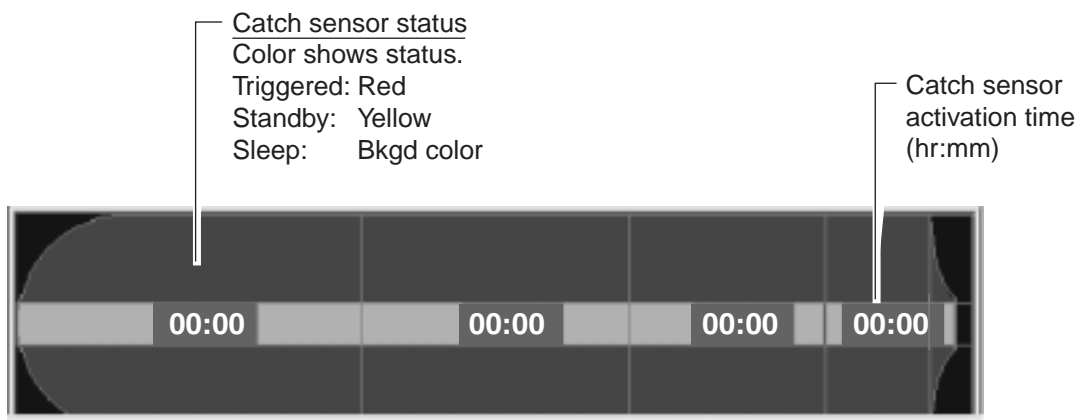
## 6.3 Testing for Switch Activation

To test for proper switch activation, do the following:

1. Submerge the unit in **<u>SALT</u>** water or short the electrode and trigger bolt.
2. Wait for about 20 seconds, then pull the lanyard for a few seconds and let go.

The LED should flash 13 seconds after the lanyard was pulled. This is the catch frequency. 13 seconds after the first flash it will flash again. This is the active frequency.

## 6.4 Flashing LED Sequence

This paragraph describes the LED sequences for the catch sensor.

1. When the batteries are first installed in the unit, the LED will flash, after a 10-second delay, 15 times. This merely indicates that there is power to the CPU and it is running.
2. When the unit is submerged (or the electrode and trigger bolt are shorted for test purposes), the LED will flash four times. This means the unit is in water.
3. After a delay of two seconds, the LED will flash once for every 100 hours that the unit has been in water without removing the batteries. If the unit has been operated for under 100 hours it will not flash.

   **Note:** If the battery cap is removed, the 100 hour counter will reset.

4. About 11 seconds after step 3 has been completed, the LED will flash once. This is when the unit is actually transmitting. If the unit is kept in water, the LED will flash every 90 seconds. (The flash indicates transmission.)

Step 4 only occurs the first time the unit is activated with new batteries. After the first time, whenever the unit is activated (via a jumper or submerged) only steps 2 and 3 occur.

## 6.5 Catch Sensor Transmission Frequency

The transmission frequency of the catch sensor(s) can be changed, by a qualified technician. For further details, contact a FURUNO agent or dealer.

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## 6.6    Installing the Batteries and O-ring

The catch sensor is powered by three "D" alkaline batteries and battery life is about 1,000 hours. When the battery voltage is low, the appropriate (yellow) "active indicator" on the catch status indicator does not appear. When this occurs, replace the batteries. It is also recommended to replace the O-ring whenever the batteries are replaced. Replacement of the O-ring is not necessary if batteries are being installed for the first time.

***Necessary tools and parts***

- Socket wrench w/19 mm or 3/4-inch socket head
- Slotted-head screwdriver
- Three "D" alkaline batteries (International Standard Number R20)
- O-ring (Parts no. 834-625-024)
- Silicone grease (non-zinc type)

1.  Use the socket wrench and socket head to unfasten the nut fixing the trigger bolt. Remove the trigger bolt together with the trigger magnet housing. Clean the trigger bolt with freshwater.
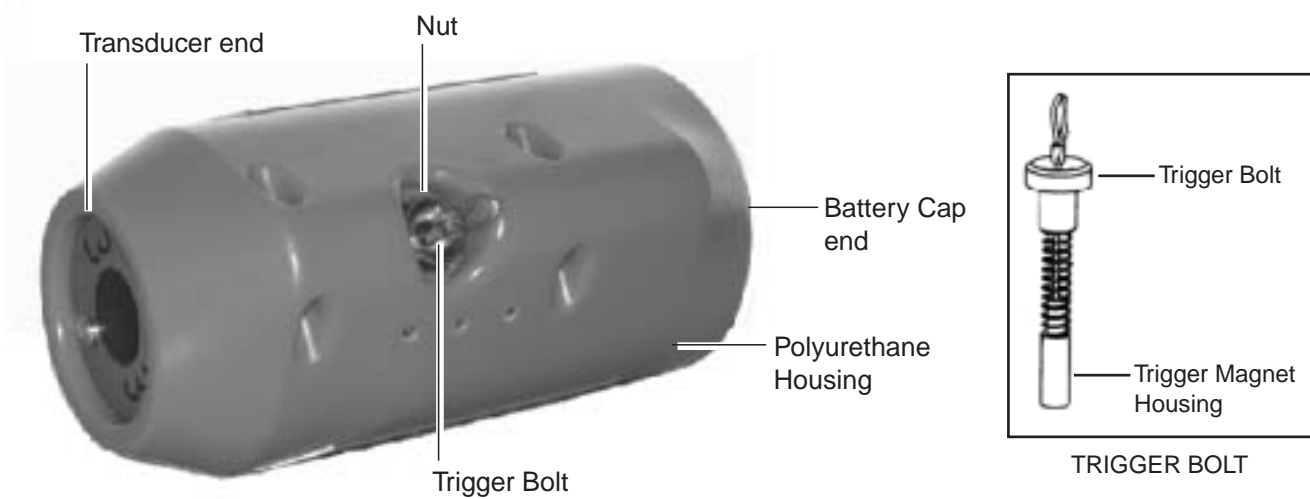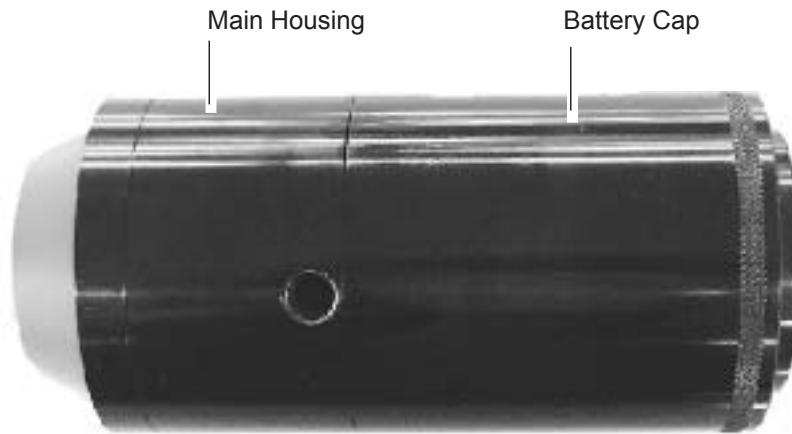


*Catch sensor*

2.  Use the slotted-head screwdriver to remove the circlip at the battery cap end of the catch sensor.



*Catch sensor, battery cap end*

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3. Pull out the battery cap together with the main housing from the polyurethane housing.

Main Housing              Battery Cap

*Main housing and battery cap*

4. Unscrew the battery cap from the main housing to access the battery holder.

Battery Holder
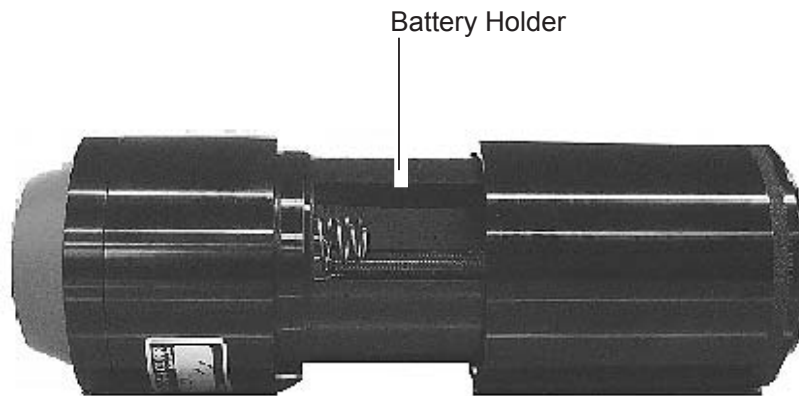
*Battery cap separated from main housing*

5. If you are replacing dead batteries, remove dead batteries.
6. Coat battery contacts with a slight amount of silicone grease.
7. Insert three new "D" (International Standard Number R20) alkaline batteries in the battery holder, all batteries plus (+) side up.

⚠ **WARNING**

**Install batteries with correct correct polarity.**

Improper polarity may cause the batteries to explode.
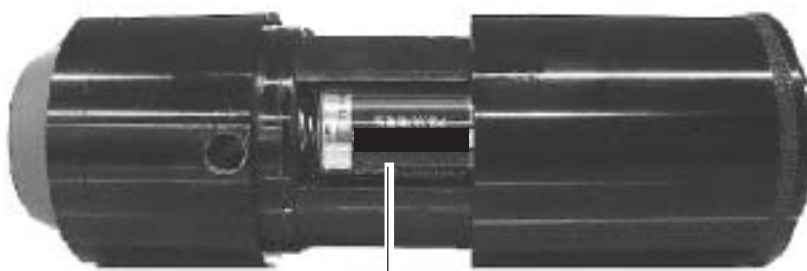
Battery inserted plus (+) side up.

*Batteries inserted in battery holder*

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8. Use your finger to remove the O-ring from the battery cap.

O-ring

*Battery cap, inside view*

9. Coat the O-ring seat and the indented area below it with silicone grease.
10. Coat the new O-ring with silicone grease and set it in its seat.
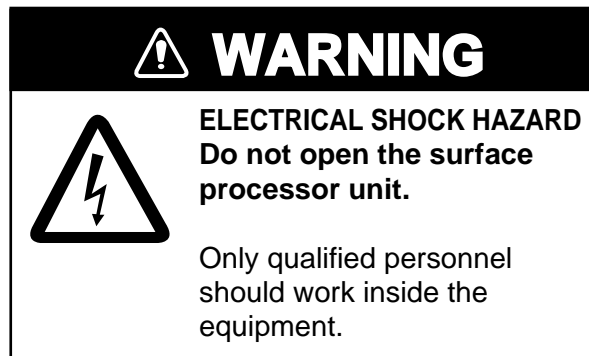11. Reverse steps 1-4 to reassemble the unit.

**Note:** Do not overtighten the main housing and battery cap or the trigger bolt.

# 7. MAINTENANCE & TROUBLESHOOTING

```
⚠ WARNING
```

**ELECTRICAL SHOCK HAZARD**
**Do not open the surface processor unit.**

Only qualified personnel should work inside the equipment.

## 7.1 General Maintenance

This equipment is designed and constructed to provide many years of trouble-free performance when properly operated and maintained. However, no machine can perform to the utmost of its ability without proper maintenance. To maintain good performance, check the following points monthly.

- Check all cables. If damaged, replace.

- Check connectors at rear of the Surface Processor Unit. Tighten or clean as necessary.

- Check ground of Surface Processor Unit. Tighten or clean as necessary.

- Check voltage of power source to be sure it is within the equipment's power rating.

- Dust or dirt can be removed from the Surface Processor Unit with a soft, dry cloth. Do not use chemical cleaners to clean the unit – they can remove paint and markings or deform the equipment.

## 7.2 Replacement of Fuse

The 2A fuse on the rear panel of the Surface Processor Unit protects the equipment from overvoltage and equipment fault. If the power cannot be turned on, check if the fuse has blown and find out the reason why it blew. If the fuse blows after replacement, contact your dealer for advice.

```
⚠ WARNING
```

**Use the proper fuse.**

Use of a wrong fuse can result in damage to the equipment or cause fire.

## 7.3 Replacement of Internal Battery

A lithium battery on the Mother Board inside the Surface Processor Unit preserves settings when the power is off. When the voltage of the battery is low, the date and time will be wrong. When this happens, have a qualified technician replace the battery, at your earliest convenience. ***Install the correct battery properly (with correct polarity). Explosion may result if the wrong battery type is used or the correct battery is installed improperly. Dispose of the battery according to the appropriate regulations.***

| Part | Type | Code No. |
|------|------|----------|
| Lithium Battery | CR2032 | 000-129-884 |

## 7.4 Testing the Underwater Unit

If you feel the underwater unit is not functioning properly, conduct the test below to check it for proper operation, using the test cable (supplied). Note that the test may be conducted in air.

***Required parts***

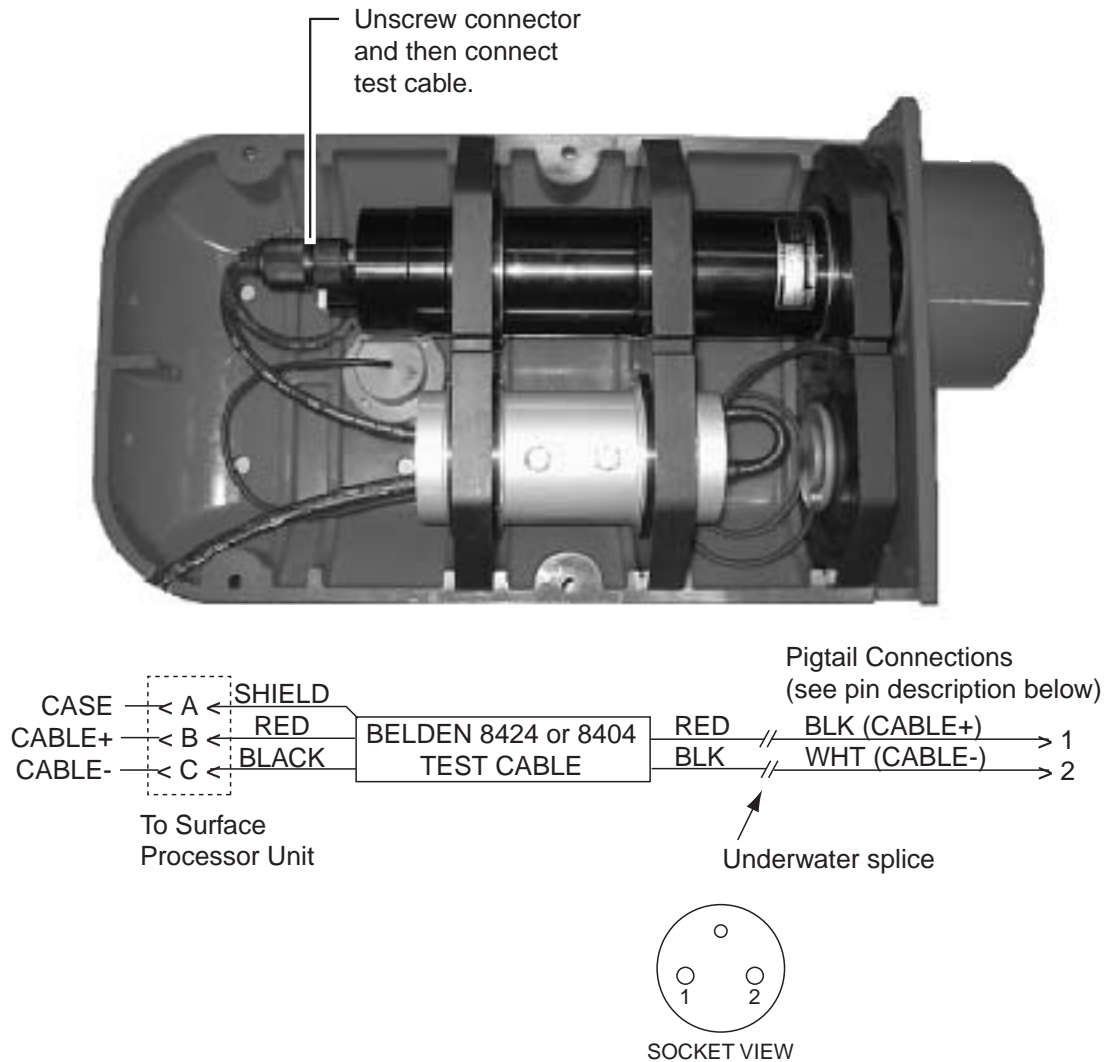- Test cable (supplied)
- Silicone spray

1. Turn off the Surface Processor Unit.
2. Open the underwater unit by unfastening six screws.



Unfasten six screws
(three more on opposite side)

Vertical Sonar
Transducer

*Underwater unit*

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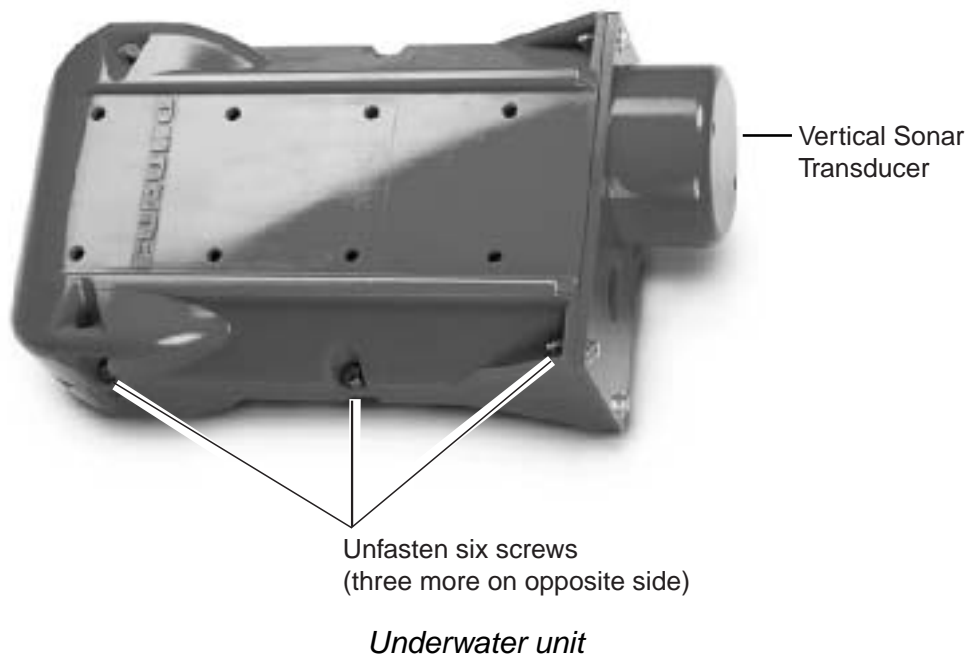
3. Unscrew the connector and then connect the test cable as shown below.



*How to connect the test cable to the underwater unit*

4. Turn on the Surface Processor Unit and monitor.
5. If the vertical scanning and echo sounder images update properly and depth and temperature readouts show 0 m and ambient temperature respectively, the underwater unit is functioning normally.

   **Note:** If echo test is required, immerse the underwater unit in water (fresh or salt water) and check for echoes.

6. Turn off the Surface Processor Unit and monitor.
7. Disconnect the test cable and then fasten the connector.
8. Spray the connector with silicone spray.
9. Close the cover. Do not overtighten screws; the case will crack if screws are overtightened.

# 7.5    Troubleshooting

The table below provides simple troubleshooting procedures which the operator may follow to restore normal operation. If normal operation cannot be restored, do not attempt to check inside the equipment. There are no user-serviceable parts inside. Refer any repair work to a qualified technician.

*Troubleshooting*

| If… | Then… | Remedy |
|---|---|---|
| the image is not updated | the "HOLD" feature may have been activated. ("HELD" appears at the top-left corner on the sonar display.) | Click the HELD button on the settings dialog box to release the hold feature. |
| image color is abnormal | image brilliance may be improperly set. | Adjust image brilliance from the monitor. |
| noise or interference appears on the screen | • gain setting may be too high.<br>• poor ground may be the cause.<br>• cables of other equipment may be too close to the Surface Processor Unit.<br>• suspect noise problem. | • Check if the gain setting is too high.<br>• Check ground.<br>• Separate cables.<br>• Check cable, winch, slip ring by using test cable. |
| the image undulates (in case of CRT monitor) | a magnetic field-generating device (rectifier, transformer, etc.) may be too close to the monitor. | Check for offending device by turning off all equipment and then turning them on and off one by one. Increase the distance between offending equipment and the Surface Processor Unit. |

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# 7.6     Diagnostic Test

The diagnostic test, which is mainly for use by service technicians, checks the equipment for proper operation. If you feel something is wrong with the equipment, run the test and report the results to the service technician, to aid in diagnosis.

## 7.6.1     Executing the diagnostic test

1.  Choose the Diagnostics menu.
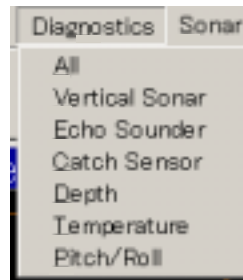


*Diagnostics menu*

2.  Choose All (or desired individual test), and the results of the diagnostic test appear.



*Diagnostic test results*

3.  To quit the test, click the Close button (X) at the top right corner of the diagnostic test results.

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## 7.6.2     Diagnostic test description

**Header:** Sent by the sonar system (wet end) to tell the Processor what kind of data format it sent, IGX for image data and ITX for normal digital data.

**Data Type:** (same as **Run-Type**) sent by the sonar system (wet end) to tell the processor this set of data is coming from which sensor.

**Serial Stat:** indicates if the communication between sonar system and Processor is normal or not.

**Head Pos:** (Head Position) a number sent by the sonar system to tell the Processor vertical sonar shooting direction. Valid number: 100-1300 (an angle between 0 to 360 degrees).

**Head Dir:** A value indicates vertical sonar scan direction: 0 for counter clockwise, 1 for clockwise.

**Range:** Vertical sonar and echo sounder operating range. The operating range for vertical sonar is 10m to250m. The operating range for echo sounder is 50m to300m.

**Sync Val:** a number that represents the level of the SYNC pulse from the sonar head and echo sounder/Catch Sensor for every shot (approximately 800).

**Data Bytes:** how many bytes the sonar system sent to the Processor for each shot.

**PRF:** milliseconds elapsed between the two consecutive interrogations for a sensor. Usually the system interrogates the Echo Sounder every second and Pitch/Roll data every 5 seconds.

**Temp Val:** temperature value sent by the sonar system (coded).

**Temp:** Decoded current temperature reading in Celsius or Fahrenheit units.

**Depth Val:** Depth value sent by the sonar system (coded).

**PSI:** a number sent by the sonar system to indicate the type of pressure sensor installed in the system. 0: 1000 PSI, maximum displayed depth 686 meters. 1: 3000 PSI, maximum displayed depth 2059 meters.
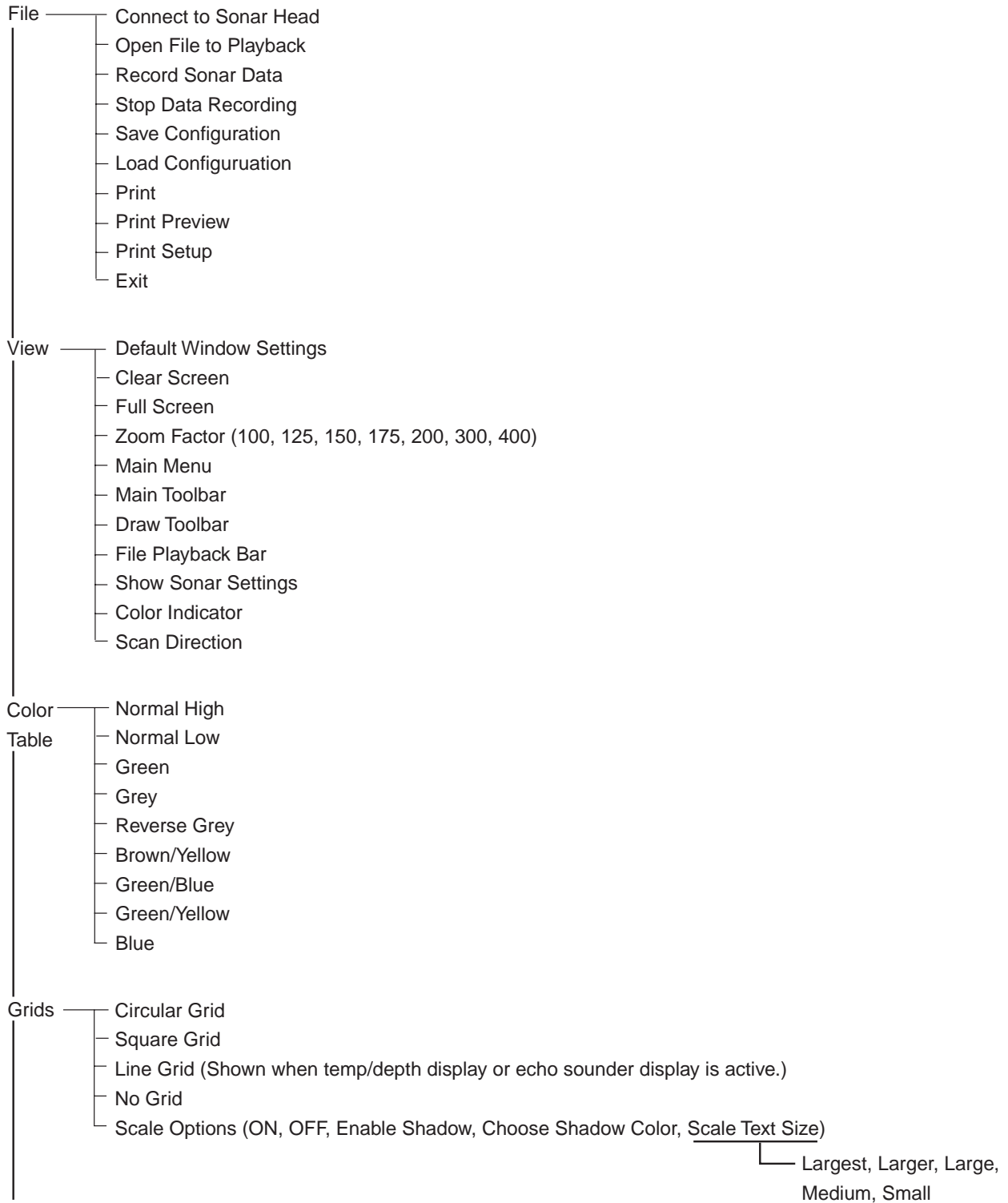
**Depth:** Decoded current depth reading.

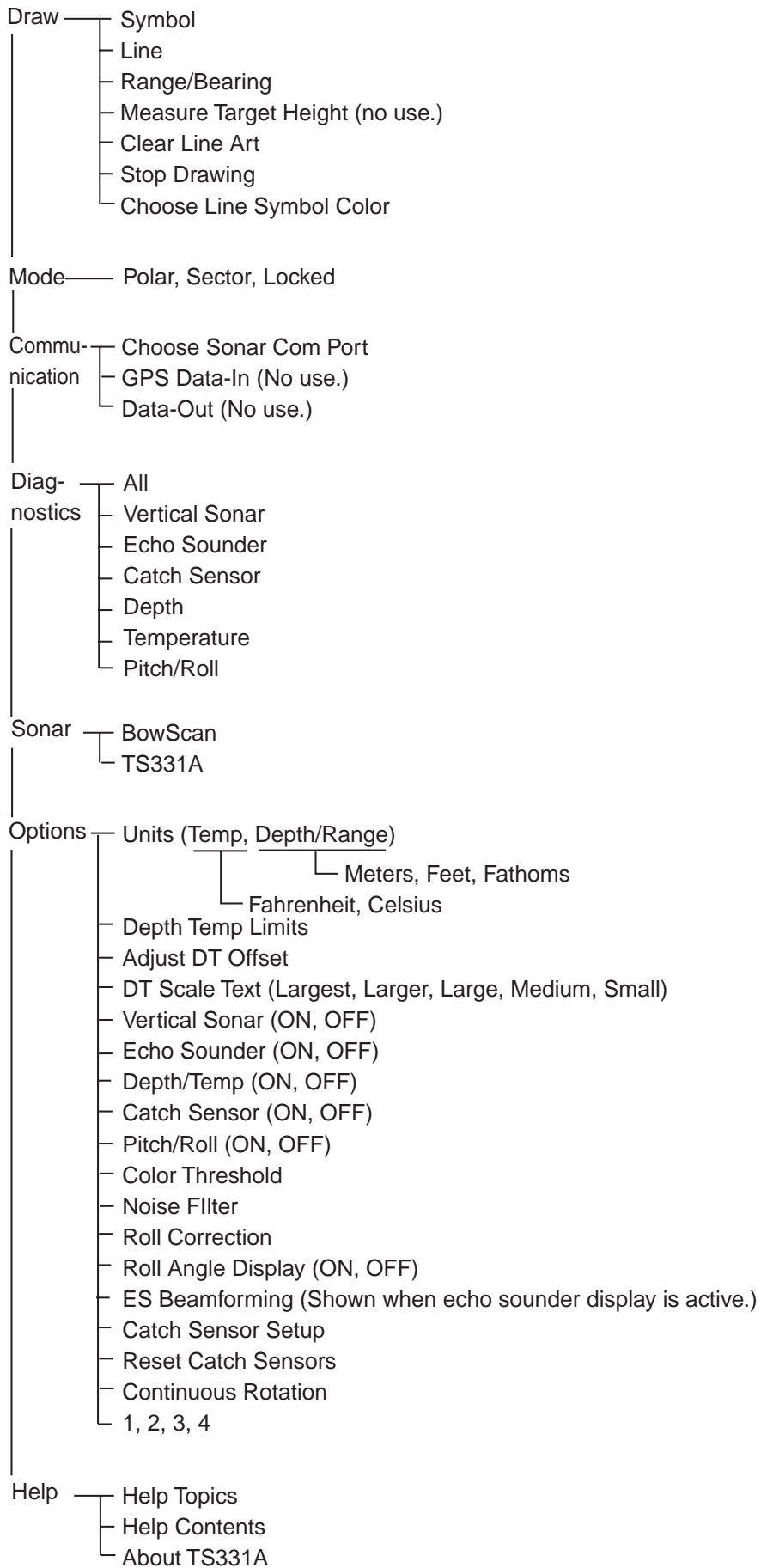**Pitch:** Decoded pitch value.

**Roll:** Decoded roll value.

**CH1, CH2, CH3, CH4:** four catch sensor channels. 0: channel (sensor) disabled or not receive any signal from this channel, 1: received stand by signal from this channel, 2: catch sensor triggered.

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# MENU TREE

File ──┬── Connect to Sonar Head
   ├── Open File to Playback
   ├── Record Sonar Data
   ├── Stop Data Recording
   ├── Save Configuration
   ├── Load Configuruation
   ├── Print
   ├── Print Preview
   ├── Print Setup
   └── Exit

View ──┬── Default Window Settings
   ├── Clear Screen
   ├── Full Screen
   ├── Zoom Factor (100, 125, 150, 175, 200, 300, 400)
   ├── Main Menu
   ├── Main Toolbar
   ├── Draw Toolbar
   ├── File Playback Bar
   ├── Show Sonar Settings
   ├── Color Indicator
   └── Scan Direction

Color ──┬── Normal High
Table ├── Normal Low
   ├── Green
   ├── Grey
   ├── Reverse Grey
   ├── Brown/Yellow
   ├── Green/Blue
   ├── Green/Yellow
   └── Blue

Grids ──┬── Circular Grid
   ├── Square Grid
   ├── Line Grid (Shown when temp/depth display or echo sounder display is active.)
   ├── No Grid
   └── Scale Options (ON, OFF, Enable Shadow, Choose Shadow Color, Scale Text Size)
                       └── Largest, Larger, Large,
                          Medium, Small

Draw
- Symbol
- Line
- Range/Bearing
- Measure Target Height (no use.)
- Clear Line Art
- Stop Drawing
- Choose Line Symbol Color

Mode —— Polar, Sector, Locked

Communication
- Choose Sonar Com Port
- GPS Data-In (No use.)
- Data-Out (No use.)

Diagnostics
- All
- Vertical Sonar
- Echo Sounder
- Catch Sensor
- Depth
- Temperature
- Pitch/Roll

Sonar
- BowScan
- TS331A

Options
- Units (Temp, Depth/Range)
  - Meters, Feet, Fathoms
  - Fahrenheit, Celsius
- Depth Temp Limits
- Adjust DT Offset
- DT Scale Text (Largest, Larger, Large, Medium, Small)
- Vertical Sonar (ON, OFF)
- Echo Sounder (ON, OFF)
- Depth/Temp (ON, OFF)
- Catch Sensor (ON, OFF)
- Pitch/Roll (ON, OFF)
- Color Threshold
- Noise FIlter
- Roll Correction
- Roll Angle Display (ON, OFF)
- ES Beamforming (Shown when echo sounder display is active.)
- Catch Sensor Setup
- Reset Catch Sensors
- Continuous Rotation
- 1, 2, 3, 4

Help
- Help Topics
- Help Contents
- About TS331A

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# SPECIFICATIONS OF WIRED TRAWL SONAR TS-331A

## 1. GENERAL

| | | |
|---|---|---|
| 1.1 | Display | PC monitor (SXGA), 1280(H)x1024(V) pixels |
| 1.2 | Display Mode | Combination with Full Circle (Polar) or Sector |
| 1.3 | Presentation Color | Nine patterns |

## 2. UNDERWATER UNIT

2.1 Operating Depth     2,000 m

2.2 Vertical Scanning Sonar

| | |
|---|---|
| Frequency | High or Low |
| Sector size | Polar: 360°, Sector: 0° to 180° |
| Scan step | 0.3, 0.6, 0.9, 1.2, 2.4° per step |
| Range | 10, 20, 30, 40, 50, 60, 80, 100, 150, 200, 250 m |

2.3 Echo Sounder

| | |
|---|---|
| Frequency | 120 kHz |
| Ranges | 50, 100, 150, 200, 250, 300 m |

2.4 Temperature Sensor

Measurement range     -5°C to +35°C

2.5 Depth Sensor

Measurement range     0 to 2000 m

2.6 Pitch/Roll Sensor     ±45°

## 3. HARDWARE, SOFTWARE

| | | |
|---|---|---|
| 3.1 | Processor | Intel 1.7 GHz Celeron |
| 3.2 | RAM | 256 MB |
| 3.3 | Video | 1280x1024x32 bit color graphics |
| 3.4 | I/O | Serial, parallel, USB, Ethernet |
| 3.5 | Operating System | Windows XP |

## 4. POWER SUPPLY

100-240VAC, 1φ, 50-60 Hz

## 5. ENVIRONMENTAL CONDITIONS

| | | |
|---|---|---|
| 5.1 | Ambient Temperature | -5°C to +35°C |
| 5.2 | Relative Humidity | 95% at 40°C |
| 5.3 | Waterproofing | Surface processor unit: IPX0 |
| | | Underwater unit: IPX8 |
| | | Catch sensor: IPX8 |

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# INDEX

**IN-2**

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