



# **HY1600 Single-frequency Thermal Printer Echo sounder Operation Manual**



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## 1 Technical Description

### 1.1 Introduction

The **HY1600** echo sounder adopts up-to-date high-integration Digital /Analog circuits, graphical LCD Module(160×80 dots), 16-gray shades thermal printer technique, etc. Two serial ports (Com 1 and Com 2) that are configured to interface with computers, motion sensors, GPS receivers, etc.



Fig.1-1 HY1600

### 1.2 Principle of Operation

**HY1600** is a 208 kHz single-frequency echo sounder. The transducer transforms electric pulse into acoustic pulse and transmits it in the water to the bottom. The acoustic pulse echoes back from the bottom are received by the transducer which turns the echoes into electric pulse, sends it to electronic circuit for calculation. Finally, the calculated depth will be displayed on LCD, presented on recording paper and sent out via the serial port. The echo sounder is composed of five modules: transceiver module, digitizing module, display control module, power module and printing module. The principle of operation is shown in Fig.1-2.

The main functions of the transceiver module are: transmitting unit generates steady, high-intensity detecting sound and receiving unit amplifies weak echo signal received by the transducer, filters unwanted noise. The filtered signals are sent to signal processing unit for successive processing—sampling and calculating.

Digitizing circuit serves the functions: to control transmission and transmitting pulse width and produce transmitting frequency; to provide synchronous signal for entire system; to deliver A/D sampling data to printing circuit; to process data and calculate depth value, then send to display control circuit and recording circuit; to maintain dynamic track.

Printing circuit performs the main functions: to control running rate of recording paper in the range of 1cm/min~20cm/min or to be in synchronism with

transmitting cycle; to print real-time analog signal of sounding (When overlapping background, the signal shall be whitened.); to print scale line and corresponding annotation; to print system menus.

Display control circuit has the main functions: to real-time display the measured depth value from quantizing circuit and make communication with external equipment via two bidirectional series ports RS-232/RS-422; to modify system menu display them on LCD. System parameters include electricity-off protection and self-test functions; delivering parameters to digitizing circuit and printing circuit.

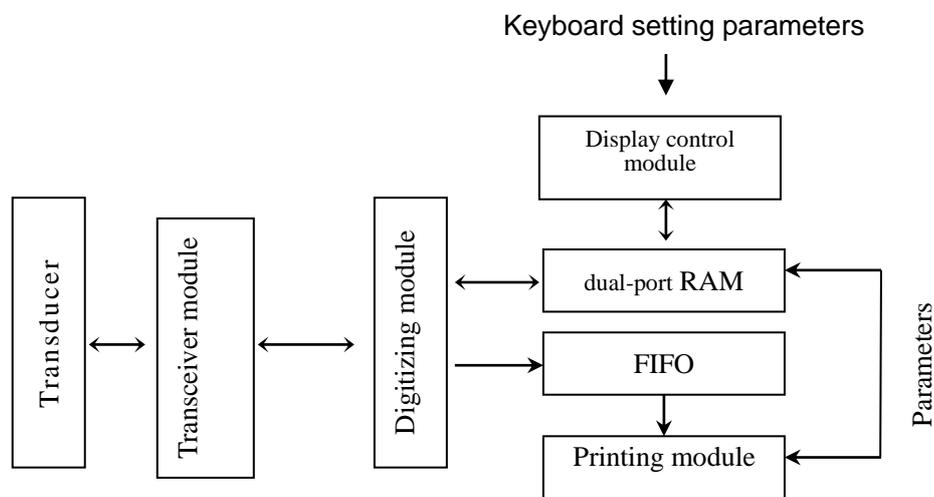


Fig.1-2 Principle of Operation

## 1.3 System Configuration

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Basic system of HY1600 echo sounder consists of main unit, transducer and appropriate kit. The system is controlled by setting and altering system parameters via keypad.

System configuration is illustrated in Fig.1-3:

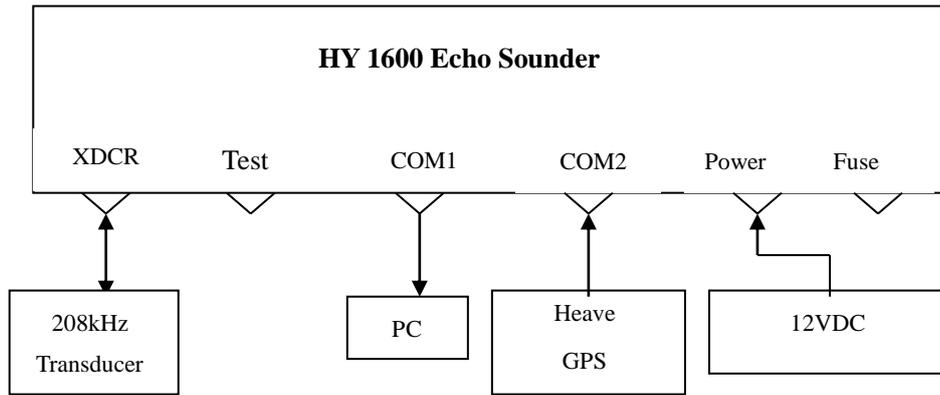


Fig.1-3 System Configuration

For interfaces of side panel, see Fig.1-4:

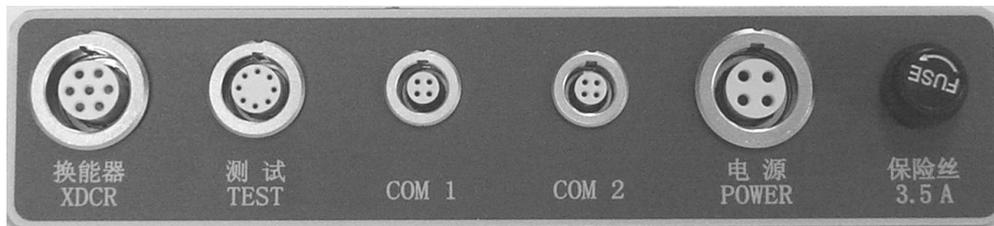


Fig.1-4 Interfaces on rear panel

## 1.4 Specifications

### Power Requirement:

Voltage: 10.8VDC~25VDC, Standard 24VDC

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## Technical Parameters:

Power consumption:	Approx. 30W
Frequency:	208kHz (Beam width $\leq 8^\circ$ )
Resolution:	0.01m
Measuring accuracy:	$\pm 0.1\% D \pm 0.01m$ (‘D’ is surveyed depth.)
Output power:	$\geq 80W$
Measuring range:	0.3m~150m
Interface:	(RS232C or RS422): Com1 and Com2

## Recording Feature:

Printing:	Thermal paper (216mm fax paper)
Display:	LCD

## System Configuration:

### Main unit:

Dimensions:	400×330×190mm
Weight:	9.8kg

### Transducer:

Dimensions:	$\Phi 80 \times 26mm$
Weight:	1.5kg
Length of cable	10m (custom option )

### Survey Tube:

Dimensions:	$\Phi 42 \times 700mm$ , 3 sections
Weight:	5 Kg
Material:	stainless steel

## Working Conditions:

Ambient temperature:	0°C~40°C
Relative humidity:	$\geq 85\%$

## Storage and Transport Temperature:

Ambient temperature:	-40°C~+55°C
Relative humidity:	$\geq 85\%$

## 1.5 Interfacing

### 1.5.1 Computer Communication

Since data acquisition system based on PC platform is widely and popularly used on surveying ship, depth sounder is required to make easy and quick

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communication in digital form. Conventional communication interface forms are RS232C and RS422. Ports, Com 1 and Com 2 of **HY1600** can perform bidirectional communication in the above-mentioned forms, that is, receiving input data from external equipment and sending out depth information. In normal configuration, at the end of each sounding cycle Com 1 sends out an ASCII character string at a baud rate of 9600 (8 data bits, 1 start bit, 1 stop bit, no parity check bit).

## 1.5.2 Serial Output Strings

### SDH-13D

Character	Description
1	Normally space, "F" indicates scaling.
2	"D"
3	"T"
4	Normally space, "E" indicates error.
5	Space
6	Depth data (most significant digit,
7	Depth data
8	Depth data
9	Depth data
10	Depth data (lowest significant digit,
11	Carriage return character

### DESO 25

Character No	Description
1	"D"
2	"A"
3	Depth data (most significant digit, MSD)
4	Depth data

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5	Depth data
6	Depth data
7	Depth data
8	Decimal Place (.)
9	Depth data
10	Depth data (lowest significant digit, LSD)
11	Space
12	"m" units
13	Carriage return character
14	Line feed character

## Echotrac

Character No	Description
1	Normally space, "F" indicates scaling.
2	"e"
3	"t"
4	Normally space, "E" indicates error.
5	Space
6	Depth data (most significant digit, MSD)
7	Depth data
8	Depth data
9	Depth data
10	Depth data (lowest significant digit, LSD)
11	Carriage return character

## Heave

Character	Description
1	Normally space, "F" indicates scaling.
2	"e"
3	"t"

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4	Normally space, "E" indicates error.
5	"H"
6	Space
7-11	Depth data
12	"+" or "-"
13-16	Heave data
17	Carriage return character

## 1.5.3 Serial Data input and Annotation

### 1.5.3.1 External Control of Unit Parameters

Many of the parameters entered via the front panel keypad may also be entered via the serial port from an external computer or terminal. The external control feature allows remote input of the operating parameters from data files or through the computer keyboard.

The 12 ASCII bytes maximum are necessary to complete a parameter transfer as shown below:

**#<Parameter Number>`Space`<New Value>CR**

**Ex: #`0` `8` `Space` `1` `7` `0` `0` CR**

The sequence begins when HY1600 receives a CONTROL P followed immediately by the parameter control string. The transfer is then complete and HY1600 returns to normal operation using the new value. In the above example the VELOCITY identified by the parameter number 08 was changed to a new value of 1700m/s.

**Note:** Input data of specific parameter part should be sound and right and can't exceed the limit range, otherwise the input is void. That is, when range of depth parameter on scale is within 000—285, input of 286 will be void. If it is required to get 50, the Specific parameter part should be 050 to meet requirement of effective bits.

### Consolidated Parameter Reference Table

Parameter Number	Description	Value	Available Bit
01	Phase	0=AUTO, 1=MANUAL	1 bit
02	Reserved		
03	Chart Depth	000--285	3 bits
04	Reserved		
05	Reserved		

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06	Reserved		
07	Bar Gate Depth	00.0--50.0	4 bits
08	Velocity	1300 --1700	4 bits
09	Time	hh mm ss	6 bits
10	Date	mm dd yy	6 bits
11*	Print Test	1=Print	1 bit
12	Min Depth	00 -- 30	2 bits
13	Skip Times	0 -- 6	1 bit
14	Chart Speed	00 -- 20	2 bits
15	Draft	00.00 – 15.00	5 bits
16	Max Depth	015 -- 300	3 bits
17	Buzzer	0=OFF, 1=ON	1 bits
18	Start No.	0000 -- 9999	4 bits
19*	Parameters Print	1=Print	1 bits
20	Fix Interval	000 – 999 000=OFF	3 bits
21	COM1 Mode	0 – 4 0=Echotrac 1=SDH-13D 2=NMEA GLL 3=DESO25	1 bits
22	COM2 Mode	0 – 4 0=OFF 1=HEAVE TSS1 2=HEAVE TSS8 3=HEAVE TSKA 4=NMEA GLL	1 bit
23	Annotation	0=OFF, 1=ON	1 bit
24	Bar Gate Width	0 – 5 0=OFF	1 bit
25	Pulse Width	1 – 4 1=0.05ms; 2=0.10ms 3=0.20ms; 4=0.4.ms	1 bit
26	Blanking	000.0 – 300.0	5 bits
Parameter number with * are only effective in the standby mode.			

## 1.5.3.2 Fix Mark and Annotation

There are three Control Commands can be transmitted to echosounder as shown below:

Command format	Description
HEX 14	Recorder stops printing.
HEX 12	Recorder restarts printing.

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HEX 06 or HEX f0

Mark via serial port

Information, which in the past would normally be handwritten on the chart record, can now be transmitted to the HY1600 via the RS232 input line. Up to 80 ASCII characters per line can be printed on the chart. Using the Heading information input facility it is possible to have this information printed automatically on a blank section of chart. Each line is still limited to the maximum of 80 characters when the **Annotation** is **ON**, but there is no limit to the number of lines of annotation.

When echosounder receives the HEX06 and HEX01, it will print the information in the mark line. The HEX04 ("Control D") is transmitted only at the end of the complete information text.

**Note:** the HEX f0 means that the sounder only print the mark line (when **Annotation** is **ON**, the sounder only print the internal annotation but the external annotation).

## 1.5.3.3 Sensors Inputs

### a. GPS

A GPS outputting NMEA GLL can be connected to the HY1600 in either COM1 or COM2. Selection of GLL will cause the most recent "X, Y" position to be printed on the chart at every Fix Mark and be displayed on the LCD. This concatenation is intended to be used in application where only one serial port is available to store data.

GPS GLL String Format:

**\$GLL,3521.7894,N,01234.5678,W,215532,A\*hh<CR><LF>**

Latitude:	3521.7894	north latitude
Longitude:	01234.5678	west longitude
Positioning time:	21:55'32"	
Status:	'A' effective ('Space' invalid)	

### b. Heave Sensor

COM2 may also be used to take in Heave data from a motion sensor. Selection of Heave IN under COM2 results in a raw Heave line, the corrected seabed, and the raw seabed, all being printed on the HY1600 chart in real-time. The output string is also corrected for the most current Heave value. The port is configured to accept the TSS standard string.

Heave TSS1 String Example:

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**001234-5432u0000-0000<CR>**

Heave: -5432cm (space positive value)

Status: 'U' available ('u' invalid)

Heave TSS8 String Example:

**A-5432 0000-0000<CR>**

Heave: -5432cm (space positive value)

Heave TSKA String Example:

**-5432 0000<CR>**

Heave: -5432cm (space positive value)

Attention: Each time depth sounding cycle is finished, character "A" should be sent in TSS8 format; character ":99" in TSKA format.

## 1.6 Cable Connections

### Transducer cable:

Pin No		Description
1	-----	NC (No Connection)
2	-----	High Frequency
3	-----	NC (No Connection)

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4	-----	SHIELD
5	-----	NC (No Connection)
6	-----	High Frequency
7	-----	NC (No Connection)

## Test cable:

Pin No		Description
1	-----	NC (No Connection)
2	-----	NC (No Connection)
3	-----	Received data output
4	-----	NC (No Connection)
5	-----	TEST
6	-----	NC (No Connection)
7	-----	GND
8	-----	NC (No Connection)

## Com1, Com2 cable:

Pin No		Description
1	-----	GND
2	-----	NC (No Connection)
3	-----	RS232 output
4	-----	RS232 input

## Power cable:

Pin No		Description
1	-----	+24VDC
2	-----	GND

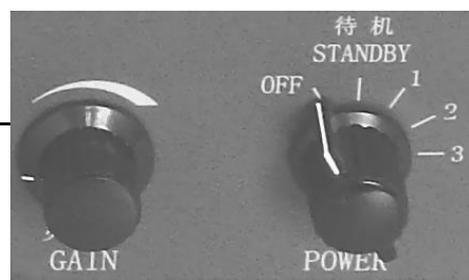
## 2. Operation

### 2.1. Introduction

This section will give a description of actual operation of analog controls, parameter controls and recorder controls.

### 2.2 Analog Controls

Analog control unit is consist of "GAIN"



potentiometer and **“POWER”** switch, as shown in Fig.2-1.

By adjusting the **“GAIN”** potentiometer, amplification applied to the returned echoes can be changed. The **“POWER”** switch has five levels.

## Fig.2-1 Analog Controls

Rotation of the switch from **OFF** to the **STANDBY** position supplies power to the entire unit and logo text is printed on chart. The LCD screen also displays the logo. In **STANDBY** the unit does not “Ping” or transmit acoustic signal. **POWER** level from **“1”to“3”** controls transmitted acoustic power from low to high and allows for the adjustment to suit varying conditions of water depth and bottom reflectivity. Deep water, mud or organic material may use the high power setting, i.e. **Level 3**; In the other extreme, low power, **Level 1** will work well in shallow water and sandy or rocky bottoms.

## 2.3 Parameter Controls

Parameters control the way the echo sounder works—digitizing, printing, or communicating to the outside interfaces.

Parameters are mainly modified by using 7 keys, as illustrated in Fig.2-2.



Fig.2-2 Menu Panel

----**“MENU”** key: (for entering Menu Selection)

Except the **Status of Menu Parameters Modification** (The Modified parameter bit will twinkling), when pressing the **“MENU”** key,

the sounder enters **Menu Type Selection** state. (**System PARs, Interface PARs, Printer PARs, Printing all PARs**)

In the **Menu Type Selection** state, press the **“MENU”** key and the sounder returns to the previous page before first pressing the **“MENU”** key.

----**“Enter”** key: (used for entering a menu or confirm the modification of parameter in the menu.)

In the state of **Operating mode selection (Use Current Setup, Use Default Setup, Com & Chart Test)**, press the **“Enter”** key and the cursor **“▶”** is enabled in the subordinate menu.

In the state of **“Use Current Setup”**, when pressing the **“Enter”** key, the

system works according to the last values entered.

In the state of **“Use Default Setup”**, when pressing the **“Enter”** key, the system works according to the manufactory default values.

In the state of **“Com & Chart Test”**, by pressing the **“Enter”** key the system enters **Test Selection** (Com 1 test, Com 2 test or printing test) menu. As cursor **“▶”** on LCD display points to Com 1 test or Com 2 test, by pressing the **“Enter”** key the system enters serial communication test page; As cursor **“▶”** on LCD display points to **“Printing test”**, by pressing the **“Enter”** key a test pattern with 16 shades of gray is printed on chart (The pattern is printed only in the **“Standby”** state.).

In the state of **Menu type selection**, when pressing the **“Enter”** key, cursor **“▶”** on LCD display will point to menu type. As cursor **“▶”** on LCD display points to **“Printing all PARs”**, by pressing the **“Enter”** key, all the parameters of the menu will be printed on chart (That is done only in the Standby state.).

When the system enters the special menu, by pressing the **“Enter”** key, the parameter pointed by cursor **“▶”** will be modified. At that time the first bit of modified parameters will be twinkling. As the parameter is changed, press the **“Enter”** key to confirm the modification. If the modification is not available, that is out of the range, the first bit of the parameter will still twinkle for modification. ---**“ESC”** key: (used for return to the previous menu or quit the parameter modification.

Except on the screen pages of **menu parameter modification** and the **operating mode selection** page, when pressing the **“ESC”** key, the system return to the previous page before pressing the **“Enter”** key or the **“Menu”** key. (The following four arrow keys are used for moving cursor or changing parameters on the menu. In case a parameter need be changed, it is required to move the cursor to the parameter at first.)

---**“↑”**key:

When a special menu is selected (not in the state of menu parameter

modification and the arrow “▲” appears in LCD display, use the “↑” key to move “▶” upward one line.

In case the “▲” mark appears at the upper left portion of LCD screen and the cursor “▶” at the first line, the previous parameters of the menu will be presented by pressing the “↑” key. In the state of **menu parameter changing**, when pressing “↑” key, the previous content ahead of the twinkling bit is displayed.

----“↓”key:

When a special menu is selected (not in the state of menu parameter modification) and the arrow “▼” appears in LCD display, use the “↓” key to move “▶” downward one line.

In case the “▼” symbol appears at the upper left portion of LCD screen and the cursor “▶” at the latest line, press the “↓” key and the next menu will be presented. In the state of **menu parameter modification**, when pressing the “↓” key, the previous content before the twinkling bit is displayed.

----“→”key:

The key is effective only in the state of **menu parameter changing**. When pressing the “→” key, the twinkling digit will move rightward one digit; In case the twinkling digit is at the utmost right, the key is noneffective.

----“←”key:

The key is effective only in the state of **menu parameter changing**. When pressing the “←” key, the twinkling digit will move rightward one digit; In case the twinkling digit is at the utmost right, the key is noneffective.

## 2.4 Chart Controls

The recorder is controlled by using three buttons, as shown in Fig.2-3.

----“**ON/OFF**” button;

The button is used for controlling the **ON/OFF** of the recording.

----“**MARK**” button:



Fig.2-3 Chart Controls

A Fix Mark line will be printed vertically on the Chart when the button is depressed.

----**“FEED”** button:

The button is used for the quick feeding of the chart paper. When the button is pressed, the recorder will feed the chart paper quickly without recording on it.

## 2.5 Menu Description

### 2.5.1 Initial Power on Display

Each time the power switch is rotated from **“OFF”** to **“Standby”**, the echo sounder sets to scanning the system and a message is displayed (as shown in Fig.2-4).

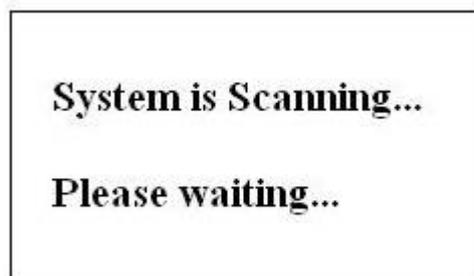


Fig.2-4 Startup Message

About three seconds later, system scanning is finished and a scanning report is shown on the screen (as shown in Fig.4-2), indicating self-test result. At that time, the operator can be aware of operating status of all parts of the echo sounder.

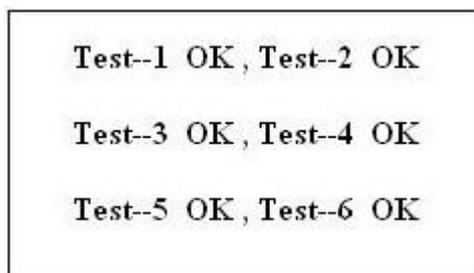


Fig.2-5 System Scanning Report

The system scanning contains six items: clock, internal memory, printing, digitizing, battery and storage. Their respective meanings are following:

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**Test-1—Clock** represents time and date output from clock chip with memory inside the echo sounder. When the sounder is energized, the system will make proper check for time and date in the chip. When data is correct, Clock item will display **OK**, otherwise **ER** will appear.

**Test-2—Internal Memory** is a memory cell for transmitting data within the echo sounder. When the sounder is powered on, the system gets to check reading and writing of all the units. When they all succeed in reading and writing, Internal Memory item will display **OK**, otherwise **ER** will appear.

**Test-3/4—Printing** and **Digitizing** indicate printing module and digitizing module. When the echo sounder is energized, the system will self-test printing module and digitizing module and send the self-testing result to LCD display. In case the two modules work reliably, the corresponding items will display **OK**, otherwise **ER** is presented.

**Test-5—Battery** indicates battery voltage supplied for memory cell inside the sounder. Once the voltage is too low, data stored in the memory cell might be lost. After the sounder is powered on, **Battery** item will display **ER** if an extreme low voltage is tested, otherwise **OK** will be presented.

Storage represents data stored in memory cells inside the echo sounder. Any parameter, after being modified, is stored in the internal memory cells. In case of power-off, these cells get power from individual battery, so data stored will not miss. System parameters are stored in multiple redundant state in order to enhance reliability of the stored data. In the power-on state, the system will compare data in each set of redundant storage location one to other and choose the same value at least two data have as a parameter value. In case that there are different data in the set of redundant storage location, **Test-6—Storage** item in self-test image will indicate **ER** to warn the operator to reset the parameters. Alternatively, parameters value of this item stored in the internal memory cell will be replaced by the default value.

The **system scanning** item covers all the parameters having influence on operation of the whole system, so it can discover abnormality at the first time, thus greatly improving reliable operation of the echo sounder.

In order to move to next screen and to begin operation, the operator must **press a key** on the front panel.

## 2.5.2 System Startup Menu

Once the first key is depressed the System Startup Menu is displayed (see Fig.2-6). This menu gives the operator the choice of continuing with the current stored parameter values (such as those for Draft and Velocity), returning to the system default parameter values, or entering the Com & Chart test.

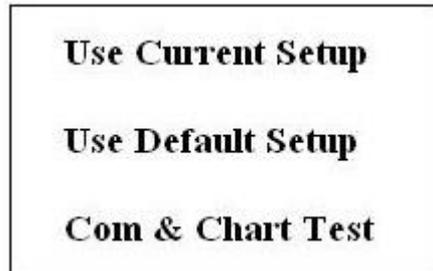


Fig 2-6 System Startup Menu

## 2.5.3 Survey Display

When **Use Current Setup** or **Use Default Setup**, the survey screen displayed as shown below. The viewdata including Depth, Date, Time, and the GPS and Heave values are optional.

For example: Current time is 13:55:45, October 20, 2003; Current depth is 105.43m, Error warning message appears; Current Heave value is 1.53m; Current GPS coordinate North latitude 38° 25'21.78", West longitude 120° 67'12.65".

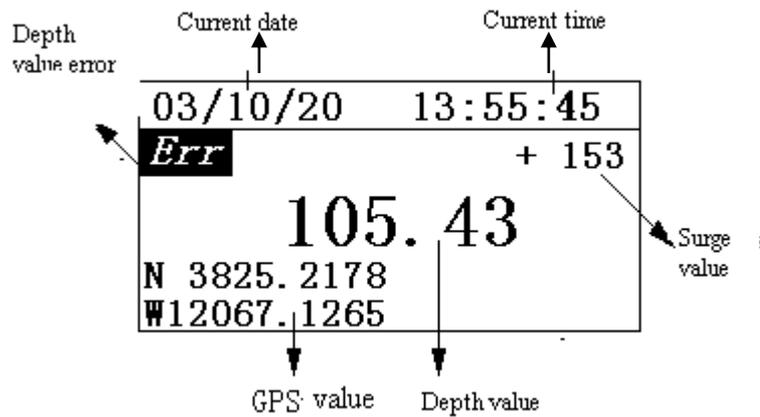


Fig.2-7 Survey Display

#### 2.5.4 Modification Parameters

The method used to change any parameter value is common to all parameters in the system. Press the **MENU** key, and choose a secondary menu as shown in Fig 2-8.

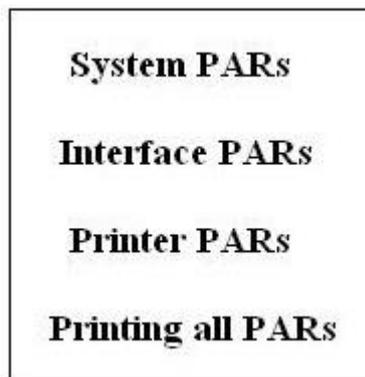


Fig 2-8 Menu Display

## 2.5.4.1 System PARs Menu

**System PARs Menu** initiates the display of the basic parameters of the unit, which include the following:

**Range:** The parameter value limits maximum sounding range. For example, when maximum depth is set to 100m, only bottom echo in water having depth of less than 100m can be processed. Thereby actual measuring cycle can be shortened and working efficiency improved.

Unit: m; Range: 15~300; Default: 150; Increment: 1.

**MinDepth:** When the measured depth is less than or equal to minimum depth value, buzzer sounds to warn the survey ship against being stranded.

Unit: m; Range: 0~30; Default: 0; Increment: 1.

**Blanking:** A **Blanking** feature is used to “mask” the transmit pulse, transducer ringing, or other unwanted acoustic returns in the near water column

(such as boat wakes etc) from the sounder. By setting the value for **Blanking** the operator can force the sounder to “look” below an interference layer. The value is entered as a distance from the water surface. **Blanking** is one of the “Key Parameters”. It would be printed on chart each time while it is changed.

Unit: m; Range: 0.0~300.0; Default value: 0.0; Increment: 0.1.

**Draft:** Draft is the correction value added to the measured depth to adjust for the difference between the depth of the transducer and the water’s surface, i.e.  $D = a + dr$ , where:

“a” --- Measured depth;

“dr” ---Draft (depth of the transducer below the water surface);

“D” --- Depth from the water’s surface.

Unit: m; Range: 0.00~15.00; Default value: 0.00; Increment: 0.01.

**Velocity:** This parameter represents the speed of sound traveling in the water.

<b>Range:</b>	<b>150</b>
<b>MinDepth:</b>	<b>0</b>
<b>Blanking:</b>	<b>0</b>
<b>Draft:</b>	<b>0</b>
<b>Velocity:</b>	<b>1500</b>
<b>Pulse Width:</b>	<b>0.20</b>
<b>Echo Alarm:</b>	<b>OFF</b>
<b>Skip Times:</b>	<b>1</b>

**Velocity** is critical to measurement accuracy.

Sound velocity is one of the “Key Parameters”. It would be printed on chart each time while it is changed.

Unit: m/s; Range: 1300~1700; Default value: 1500; Increment: 1.

**Pulse Width:** This parameter determines transmitting pulse width. In order to obtain optimum result the operator should adjust transmitting pulse width according to actual water depth. Generally, the deeper the bottom is the bigger the pulse width selected.

Unit: ms; four optional items: 0.05, 0.10, 0.20, 0.40; Default value: 0.20

**Echo Alarm:** This parameter determines whether the buzzer sounds when the echo sounder can't get effective depth data or depth value is below /equal to minimum depth value.

The parameter has only two optional items: ON, OFF; Default value: OFF.

**Skip Times:** This parameter determines times of filling up with the previous effective depth value when the processed depth is 0.00. At that time the previous effective depth values displayed. When the parameter is set to OFF or times of continuous fill-up exceeds the setting value, the depth value is 0.00 and an error message appears.

It has seven optional items: OFF, 1, 2, 3, 4, 5, 6; Default value: 1.

## 2.5.4.2 Interface PARs Menu

Parameters in the Interface PARs Menu have their respective definition as below:

**Com 1:** it determines communication format at Com 1 port. When “NMEA GLL” is selected, Com 1 port is GPS input; when other format is selected, Com 1 port is depth value output. The depth value output format and GPS input format are seen in section 1.5.2.

Selective items are: SDH-13D, Echotrac, DESO 25 and NMEA GLL, Default: Echotrac.

**Com 1 Baud:** it represents communication baud rate of Com 1 port of HY1600.

**Com1: Echotrac**

**Com1 Baud: 9600**

**Com2: OFF**

**Com2 Baud: 9600**

**Time: 08:35:15**

**Date: 03/10/18**

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Unit: bit/s, Three optional items: 4800, 9600, 19200, Default value: 9600.

**Com 2:** it determines communication format at Com 2 port. When “NMEA GLL” is selected, Com 2 port is GPS input; When OFF is selected, Com 2 will not receive Heave compensation or GPS data; when other format is selected, Com 2 port becomes input port of Heave compensation value.

Optional items are: OFF, NMEA GLL, Heave TSKA, Heave TSS8, Heave TSS1, Default: OFF.

**Com 2 Baud:** it represents communication baud rate of Com 2 port of HY1600.

Unit: bit/s, Three optional items: 4800, 9600, 19200, Default value: 9600.

**Time:** An internal real-time clock /calendar chip with a memory is provided. The correct time of day (or reference time) is entered via this Time parameter. The input format is “hh/mm/ss”.

**Time** is one of the “Key Parameters”. It would be printed on chart each time while it is changed.

**Date:** The current Date is entered in much the same manner as time is adjusted. Its format is “yy/mm/dd”.

## 2.5.4.3 Printer PARs Menu

Parameters in the Printer PARs Menu have their respective definition as below:

**Chart Depth:** The **Chart Depth** refers to the depth value at the initial of the printed chart. In the **auto phasing** mode, the **Chart Depth** value is recomputed each time the digitized depth approaches either scale limit.

Unit: m, Range: 0~285, Default: 0, Increment: 1.

**Chart Width:** Scale limits printed on chart from Chart Depth.

Unit: m. Values: 10, 20, 40, and 80. Default: 40.

**Chart Speed:** The advance rate of the recorder paper. Possible speeds range from Sync(0): every

Chart Depth:	0
Chart Width:	40
Chart Speed:	6
Chart Shift:	Auto
Fix Interval:	OFF
Start No.:	1
Cal Width:	OFF
Cal Depth:	0.0
Annotate:	OFF
Heave:	OFF
Grey Shades:	OFF

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sounding cycle, the chart is printed once and advance one step.

Unit: cm/s, Range: 0~20 (0: Sync), Default: 6

**Chart Shift (Phasing):** When **Chart Shift** is on **Auto** mode, the system can automatically calculate scaling depth from the measured depth and send it to the recorder for printing. As the bottom approaches the chart limits, the recorder automatically adjusts its phase so that the bottom is always plotted on the chart. In **Manual** mode the echo sounder is restricted to make effective measurement within the range of depth on the chart.

Only two selections are available: Manual, Auto. Default value: Manual.

**Fix Interval:** The fix scaling interval is specially provided for HY1600 itself for the recorder to printing Fix Line and annotation.

Unit: s; Range: 0~999 (0: OFF); Default: 0; Increment: 1.

**Start No.:** It is to set the first counting number of the Fix Mark line.

Range: 0~9999; Default value: 1; Increment: 1.

**Cal Width (Bar Gate Width):** The parameter is used for determining the range of depth calculated from bar printed on chart. When the parameter is OFF, the system will search echo signals in the range of maximum depth; when not in OFF, the search is limited in the range determined by the Cal width and Cal depth.

Unit: m; Range: 0~5 (0: OFF), Default: OFF; Increment: 1.

**Cal Depth (Bar Gate Depth):** When tracking gate is not off, the parameter will determine the initial depth value of the gate during chart printing; while in OFF, the parameter is invalid.

Unit: m, Range: 00.0~10.0, Default value: 0, Increment: 0.1

**Annotation:** With Annotation ON, each Fix Mark results in the depth, time, and date being printed on the Fix Line. Annotation OFF results in a single black line being printed across the chart.

**Heave:** When the Com2 parameter chooses "Heave \* \*\*", the parameter will determine the **Heave value** display on the LCD. Meanwhile a **Heave curve** is printed on the chart paper, and the depth values will be revised.

While Com2 parameter chooses "OFF" / "NMEA GLL" or **Heave** in OFF, the parameter is invalid.

Only two selections are available: ON, OFF; Default value: OFF.

**Grey Shades:** The echo line will be darkened or weakened with variation of

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echo signal while in ON. The stronger the echo signal, the darker the echo line is and vice versa. When the parameter is in "OFF", the echo line won't have any color change in chart paper.

Only two selections are available: ON, OFF; Default value: OFF.

## 2.5.4.4 Printing all PARs

Only when the **POWER** switch is in **STANDBY** and the cursor "▶" is set to **Print Parameter**, pressing the **ENTER** key, all the current settings, 23 parameters are completely printed on the chart. The system must be in **STANDBY**. Otherwise this menu is void.

## 2.5.5 Com & Chart Test

When moving cursor "▶" to **Com & Chart Test**, press the "Enter" key, the **Com & Chart Test** menu will be shown as following:

<b>Com 1</b>	<b>Test</b>
<b>Com 2</b>	<b>Test</b>
<b>Chart</b>	<b>Test</b>

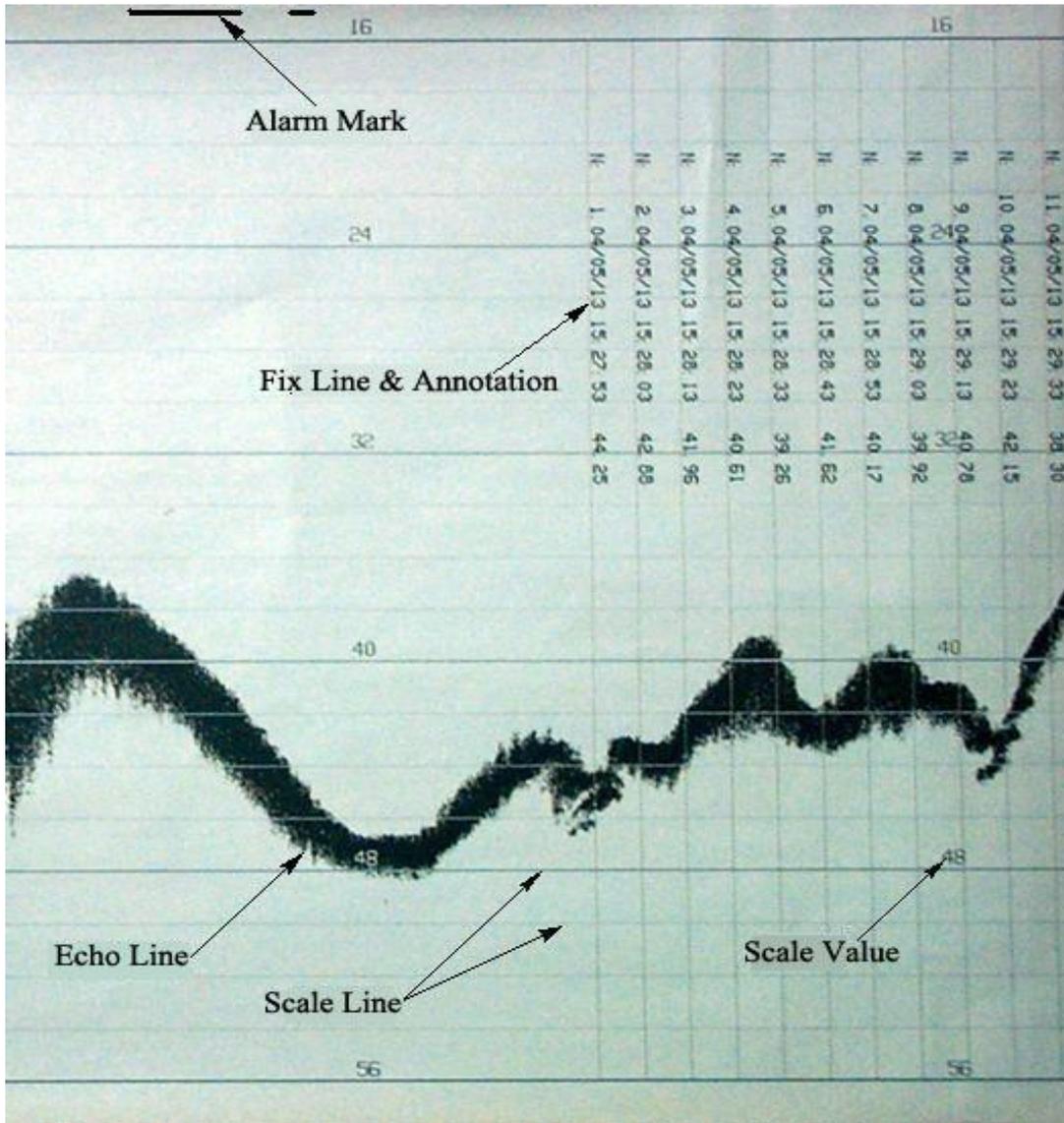
Pressing the **ESC** key will bring the system back to the **System Startup** menu. Selection of Com1, Com2, or Chart Test initiates diagnostic tests of the selected modules.

During the Com1/Com2 Testing status, the sounder will send the code ASCII '8' (HEX38) via the serial port (Com1/Com2) serially, meanwhile the serial port (Com1/Com2) also will be ready to receive the input data and indicate the data via display screen. The display screen will indicate the character '8' serially if make the transmit port and receive port short-circuit, namely make the pin3 and pin4 which inside the jack of Com1 or Com2 port in front panel short-circuit

directly.

Chart Test causes diagonal bars in 16 shades of gray to be printed across the chart. The bands should be examined to confirm that all dots are printing (no gaps in the band) and that at least 4 shades of gray are present.

## **2.6 Chart Paper**



### 3. Installation and Maintenance

#### 3.1 Installation

##### 3.1.1 Transducer Installation

Proper mounting of the transducer is a crucial part of the installation of any echo sounder. An Improperly mounted transducer will result in poor system operation and unacceptable data quality.

In the case of temporary installations, the transducer is often mounted over-the-side. In permanent installations, hull mounts are generally preferred. In either case, the transducer should be mounted as far below the waterline as possible.

The transducer should be mounted far enough aft of the bow so that bubbles generated by the bow wave will not pass over the face of the unit. Transducers should be located away from sources of turbulence and cavitations bubbles such as propellers, bow thrusters and hull protrusions. Consideration should also be given to sources of mechanical noise generated within the vessel (engines, propellers, pumps, generators, etc.). In some severe cases of mechanically coupled noise, vibration-isolating mounts may be required to mechanically decouple the transducer from the hull. Transducer mounting can be accomplished in many different ways. The following is a list of common configurations:

### 3.1.1.1 Over-the-Side

A mount of this type is frequency constructed from a length of pole. This fixture should be sized to position the transducer well below the waterline and the pole then fixed to a sturdy support on the vessel. Lines generally are attached at the transducer pole and tied off fore and aft in order to maintain a stable, horizontal transducer attitude.

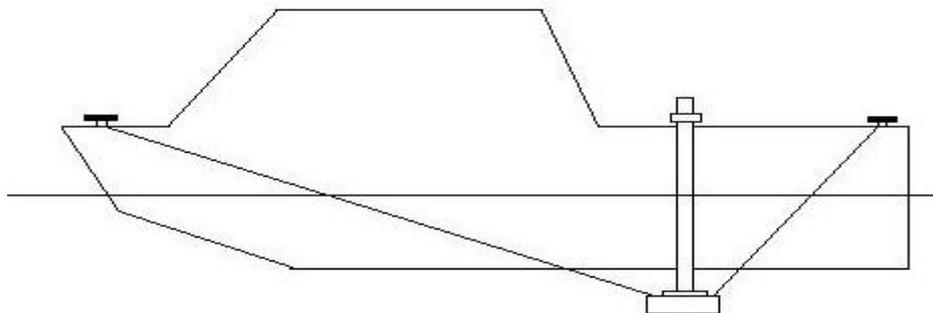


Fig.3-1 Over-the-side Mount

### 3.1.1.2 Through Hull

Transducer is often mounted through hull as shown in Fig.3-2.

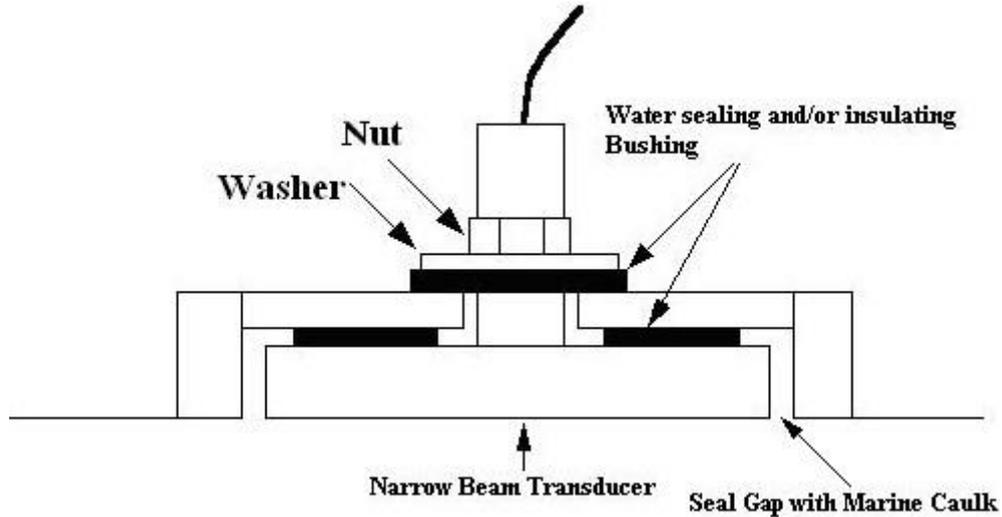


Fig.3-2 Through Hull

Note: Care should be taken to protect the transducer cable and the joining part of transducer and cable. The transducer's transmitting surface should keep as parallel with water horizontal as possible during surveying.

### 3.1.2 Paper Loading

Chart paper is transported in the manner shown in Fig.3-3.

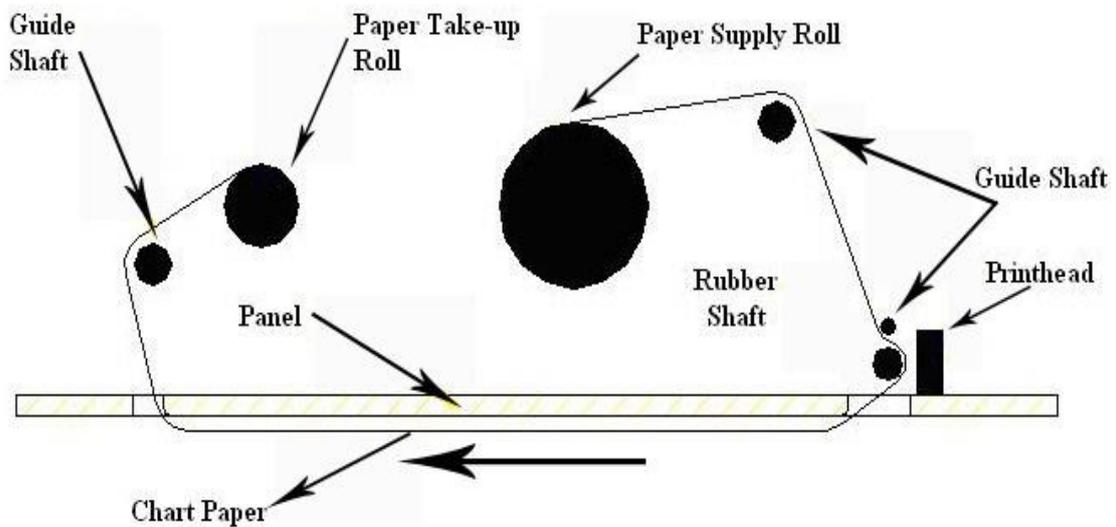


Fig. 3-3 Paper Transport Diagram

HY1600 Echo sounder uses thermal recording paper. The rolls are 216mm wide and contains approximately 30m (long) of paper. Two stepping motors are used for realizing running of chart paper. The loading procedure is as below:

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- A. Place the **POWER** switch to the **STANDBY** position and the HY1600 stops charting now.
- B. Remove the window cover. Cut the paper at a convenient point past the recorded data and remove the old chart.
- C. Open the chart panel by unscrewing the two captive fasteners at the left of the front panel (Fig. 3-5). Swing the panels completely open to the last stop point on the support arm.
- D. Locate the printhead release lever (Fig. 3-6) located below the printhead. Withershins push the lever in order to raise the printhead away from the paper and roller.
- E. Remove any remaining paper from the paper path, release the roll axis and remove the spent supply roll from the holder mechanism (Fig. 3-4). Use the same motion in order to remove the take-up roll from its holder mechanism.
- F. Insert the fresh roll of paper so that the core engages the top paper-centering stud and so that the paper comes off the roll at the rear (as viewed from the front panel side of the unit) and the outside surface of the paper faces the printhead.
- G. Align the roll so that it engages the lower centering stud, as it is set onto the lower paper guide. Feeding paper past the printhead.
- H. Feed paper off the supply roll from the rear and over the paper drive roller with the outside surface of the roll toward the printed. Only the outside surface of the paper will produce an image.  
**Note:** the printhead release lever must be in the released position in order to accomplish this task.
- I. Once a small amount of paper is fed across the roller past the printhead, pull approximately 50cm through the printer. This can be done easily if the paper is not allowed to engage the rubber paper drive roller with too much tension. Feeding paper manually off the supply roll while pulling it past the printhead will assist in this task. Once sufficient paper is fed past the printhead, center the paper manually and **return the printhead release lever to the engaged position** (head locked down on the supply roller).
- J. Guide the end of the paper through the paper entry slot and over the take-up roller bar. Pull the excess paper through the slot.
- K. Using a small piece of tape, attach the end of the paper to an empty paper

- core being sure to align the top and bottom edges of the paper with the ends of the core. Wind the extra paper up tightly onto the core.
- L. Close the paper access panel by first releasing the support arm, closing the panel, and then re-tightening the two captive screws..
- M. Press the **FEED** switch (in the front panel) and observe that paper moves smoothly past the printhead across the paper access panel, and is wound onto the take-up core.
- N. At this point the recorder should be ready for normal operation.

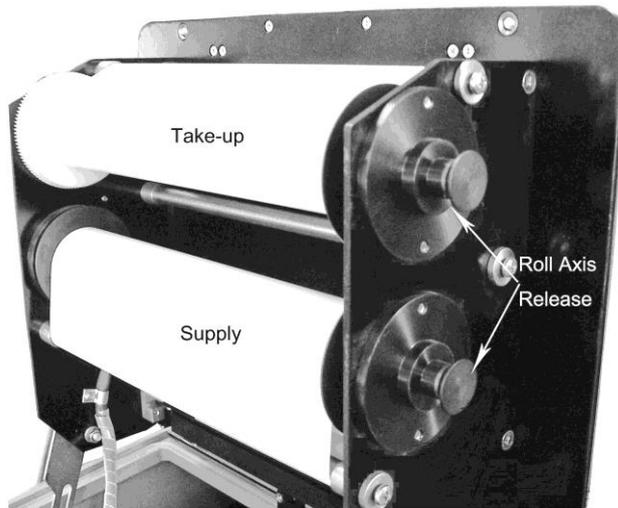


Fig. 3-4 Paper Supply & Take-up Rolls

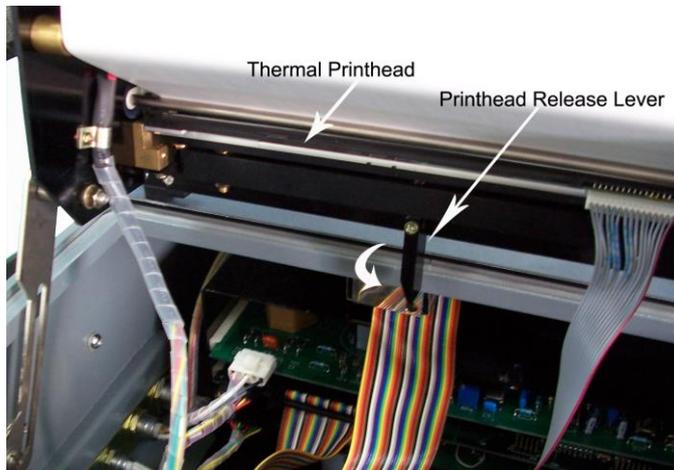


Fig. 3-6 Thermal Printhead & Release Lever

## 3.2 Maintenance

- A If the system can't be started, examine power supply and fuse (At the lower right part of the echo sounder, beside the power socket). In the case that fuses blows frequently, the echo sounder should be thoroughly inspected.

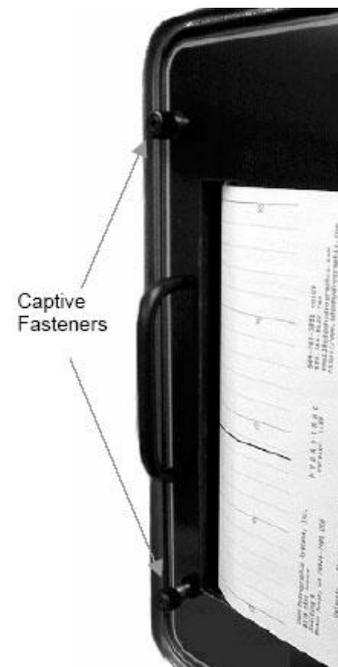


Fig. 3-5 Panel Release

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- B. Transducer should be cleaned frequently with plastic blade or scrub brush.  
Notice: Transducer surface is not allowed to be cleaned with metallic object or sprayed with anything.
- C. The main unit can be scrubbed and cleaned with weariless agent. The recording window should be cleaned with glass detergent. Be cleaning gently and not before.
- D. Any damaged or bare cable is not allowed to be put into duct. Inspect insulation of cable monthly.
- E. If there is something wrong with a high-density, large-scale surface device echo sounder, maintenance on the spot is rather difficult. A more convenient and quick remedy is to replace the faulty circuit.

**It is suggested to purchase spare key circuit boards for later repair use.**

## **Appendix A. Factory Default Values of Parameters**

### **Range:**

Unit: m; Range: 15~300; Default value: 150; Increment: 1.

### **MiniDepth:**

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Unit: m; Range: 0~30; Default value: 0; Increment: 1.

## **Blanking:**

Unit: m; Range: 0.0~300.0; Default value: 0.0; Increment: 0.1.

Draft:

Unit: m; Range: 0.00~15.00; Default value: 0.00; Increment: 0.01.

## **Velocity:**

Unit: m/s; Range: 1300~1700; Default value: 1500; Increment: 1.

## **Pulse Width:**

Unit: ms; Four optional items: 0.05, 0.10, 0.20, 0.40; Default value: 0.20

## **Echo Alarm:**

The parameter has only two optional items: ON, OFF; Default value: OFF.

## **Skip Times:**

Unit: times; It has seven optional items: OFF, 1, 2, 3, 4, 5, 6; Default value: 1.

## **Com 1:**

Four selective items are: SDH-13D, Echotrac, DESO25, Heave and NMEA GLL; Default item: Echotrac.

## **Com 1 Baud:**

Unit: bit/s, Three optional items: 4800, 9600, 19200, Default value: 9600.

## **Com 2:**

Optional items are: OFF, NMEA GLL, Heave TSKA, Heave TSS8, Heave TSS1, Default item: OFF.

## **Com 2 Baud:**

Unit: bit/s, Three optional items: 4800, 9600, 19200, Default value: 9600.

## **Chart Depth:**

Unit: m; Range: 0~285; Default value: 0; Increment: 1.

## **Chart Width:**

Unit: m; Four optional items: 10, 20, 40, 80; Default value: 40.

## **Chart Speed:**

Unit: cm/min, Range: 0~20 (0=Synchronous state), Default value: 6.

## **Chart Shift:**

Only two selective items: Manual, Automatic, Default value: Manual

## **Fix Interval:**

Unit: s; Range: 0~999 (0=OFF), Default value: 0, Increment: 1.

## **Start No.:**

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Range: 0~9999, Default: 1, Increment: 1.

## **Cal Width:**

Unit: m, Range: 0~5, (0=OFF), Default value: 0 (OFF), Increment: 1.

## **Cal Depth:**

Unit: m, Range: 00.0~50.0, Default value: 0.0, Increment value: 0.1.

## **Annotation:**

Two selective items: On, OFF, Default value: OFF.

## **Heave:**

Two selective items: On, OFF, Default value: OFF.

## **Grey Shades:**

Two selective items: On, OFF, Default value: OFF.

## **Appendix B. Sound Velocity Table (Pure Water)**

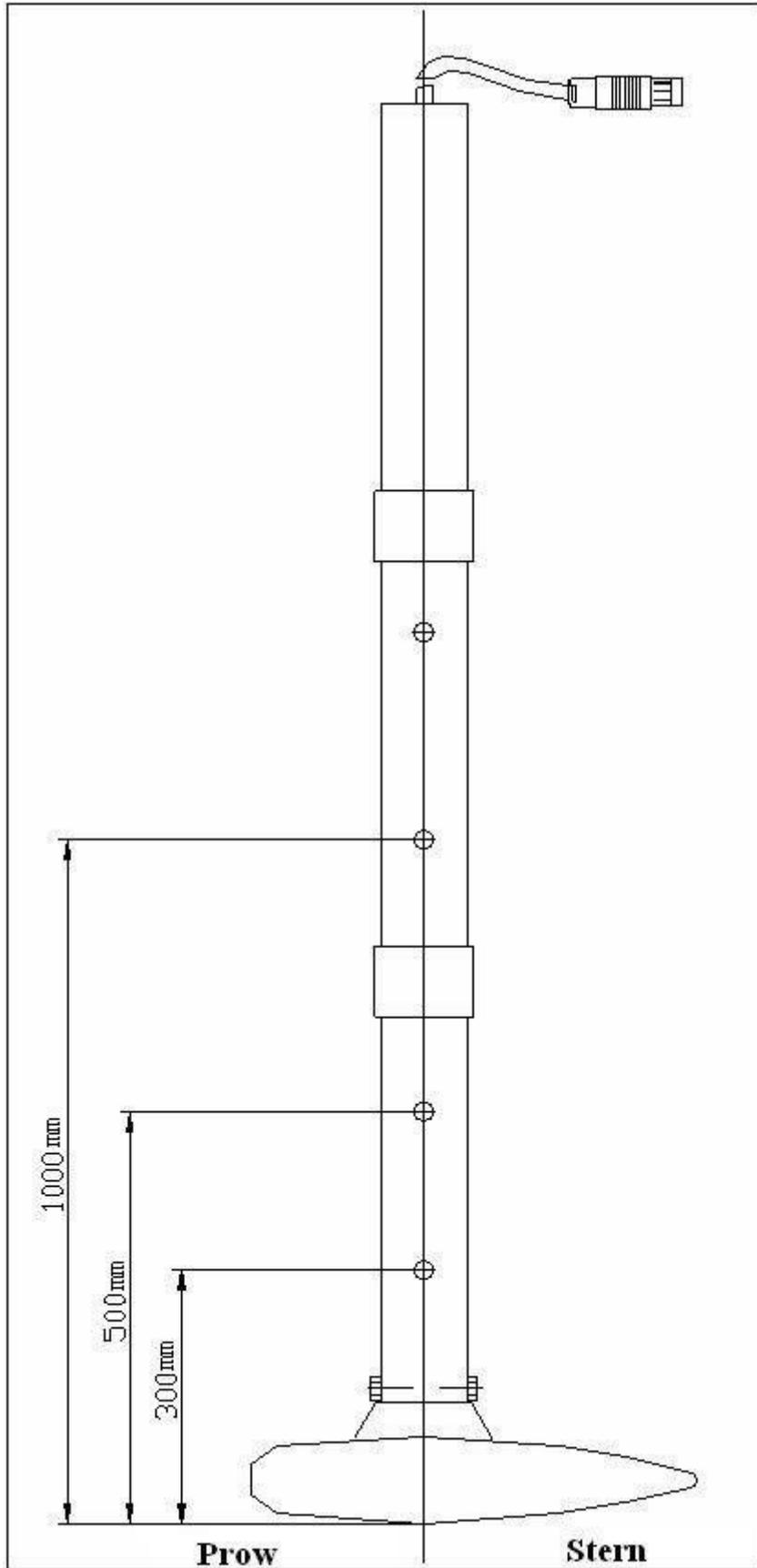
Temperature (°C)	Sound Velocity (m/s)	Temperature (°C)	Sound Velocity (m/s)
0.0	1402.74	20.0	1482.66
0.5	1405.24	20.5	1484.19
1.0	1407.71	21.0	1485.69
1.5	1410.15	21.5	1487.17

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2.0	1412.57	22.0	1488.63
2.5	1414.96	22.5	1490.07
3.0	1417.32	23.0	1491.50
3.5	1419.65	23.5	1492.91
4.0	1421.96	24.0	1494.29
4.5	1424.24	24.5	1495.66
5.0	1426.50	25.0	1497.00
5.5	1428.73	25.5	1498.33
6.0	1430.92	26.0	1499.64
6.5	1433.09	26.5	1500.93
7.0	1435.24	27.0	1502.20
7.5	1437.36	27.5	1503.45
8.0	1439.46	28.0	1504.68
8.5	1441.53	29.5	1505.90
9.0	1443.58	29.0	1507.10
9.5	1445.60	29.5	1508.28
10.0	1447.59	30.0	1509.44
10.5	1449.56	30.5	1510.58
11.0	1451.51	31.0	1511.71
11.5	1453.44	31.5	1512.82
12.0	1455.34	32.0	1513.91
12.5	1457.22	32.5	1514.99
13.0	1459.07	33.0	1516.05
13.5	1460.90	33.5	1517.09
14.0	1462.70	34.0	1518.12
14.5	1464.49	34.5	1519.13
15.0	1466.25	35.0	1520.12
15.5	1467.99	35.5	1521.10
16.0	1469.70	36.0	1522.06
16.5	1471.40	36.5	1523.00
17.0	1473.07	37.0	1523.93
17.5	1474.72	37.5	1524.84
18.0	1476.35	38.0	1525.74
18.5	1477.96	38.5	1526.62
19.0	1479.55	39.0	1527.49
19.5	1481.12	39.5	1528.34

**Appendix C. The Survey Tube Connected Diagram**



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## **Appendix D. Company Information**

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