



# **KODEN**

## **OPERATION MANUAL**

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### **NAVIGATIONAL ECHO SOUNDER**

# **CVR-010**



**CVR-010 Operation Manual**  
**Doc No. 0093101002**

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## **General Safety Warnings – 1/2**

- (1) THE REAR-PANEL TRANSDUCER CONNECTOR RECEPTACLE IS EMITTING EXTREMELY HIGH VOLTAGE RADIO-FREQUENCY PULSES WHEN THE EQUIPMENT IS TURNED ON.**

**THE CONNECTOR IS NORMALLY COVERED WITH A SCREW-LOCKED PROTECTIVE RUBBER CAP WHEN THE EQUIPMENT IS INITIALLY DELIVERED.**

**TO AVOID COMING INTO CONTACT ACCIDENTALLY WITH ANY OF THE CONNECTOR PINS, BE SURE TO PLACE THE PROTECTIVE CAP OVER THE RECEPTACLE WHENEVER THE TRANSDUCER IS UNPLUGGED.**

**LOCK THE CAP WITH THE TWO SCREWS ATTACHED.**

- (2) TO COMPLY WITH THE RELEVANT WHEEL-MARK TYPE APPROVAL REGULATIONS, THE EQUIPMENT MUST BE OPERATED USING ONE OF THE TRANSDUCERS SPECIFIED IN THIS MANUAL. OPERATION WITH A TRANSDUCER OTHER THAN A SPECIFIED ONE IS NOT OFFICIALLY APPROVED, AND THE RESULTS OBTAINED WITH SUCH A TRANSDUCER MUST NOT BE USED FOR NAVIGATIONAL PURPOSES.**

- (3) THE ACCURACY OF THE ON-SCREEN DEPTH READOUT IS AFFECTED BY WATER TEMPERATURE, SALINITY, DEPTH AND OTHER UNDERWATER CONDITIONS AS WELL AS THE SHIP'S ROLL AND PITCH, HEEL AND TRIM.**

**TAKE THESE POSSIBLE ERROR-CAUSING FACTORS INTO CONSIDERATION WHEN USING THE DEPTH READOUT, SUCH AS WHEN NAVIGATING SHALLOW AREAS OR IN APPLICATIONS WHERE ACCURATE DEPTH READING IS CRITICAL.**

- (4) DURING SHALLOW WATER OPERATION, THE EQUIPMENT MAY OCCASIONALLY READ TWICE THE ACTUAL DEPTH BY LOCKING ONTO THE SECOND BOTTOM ECHO.**

**THE DIGITAL DEPTH READOUT SHOULD ALWAYS BE COMPARED WITH THE GRAPHIC BOTTOM INDICATION OR WITH SOUNDINGS DATA IN OFFICIAL NAUTICAL CHARTS TO DETERMINE THE TRUE DEPTH.**

**TOTAL RELIANCE ON THE DIGITAL READOUT ALONE FOR DEPTH INFORMATION IS DANGEROUS AND MUST BE AVOIDED.**

*See paragraph 7.4.2 for more information on the second bottom echo.*

- (5) WHEN THE DEPTH REFERENCE INDICATION IS SET TO "BELOW KEEL," BE SURE TO ENTER THE APPROPRIATE KEEL OFFSET TO AVOID ANY MISUNDERSTANDING ABOUT THE DEPTH READOUT.**

*See paragraph 8.10.7.3 for more information on keel offset.*

## **General Safety Warnings – 2/2**

- (5) WITH A TRANSDUCER DRAFT ENTERED, THE ON-SCREEN DIGITAL READOUT SHOWS THE DEPTH FROM THE WATERLINE AND NOT FROM THE TRANSDUCER FACE OR FROM THE SHIP'S KEEL. GREAT CARE SHOULD, THEREFORE, BE TAKEN IN USING THE DEPTH READOUT WHEN NAVIGATING SHALLOW WATER AREAS. BE SURE TO SET THE DEPTH REFERENCE TO "BELOW SURFACE" (DBS) TO AVOID ANY MISUNDERSTANDING.**

*See paragraph 8.2 for more information on transducer draft.*

- (6) DO NOT SWITCH THE EQUIPMENT ON WITH THE TRANSDUCER OUT OF WATER, SUCH AS WHILE THE VESSEL IS DRY-DOCKED, OR THE TRANSDUCER'S CERAMIC CRYSTALS MAY BE DAMAGED IRREPARABLY.**

- (7) THE DISPLAY CABINET IS NOT WEATHERIZED FOR OUTDOOR INSTALLATION OR OPERATION. ANY DAMAGE CAUSED, WHETHER DIRECTLY OR INDIRECTLY, THROUGH WATER INGRESSION IS NOT COVERED BY THE MANUFACTURER'S OR DEALER'S WARRANTY.**

- (8) CHECK TO BE SURE THAT THE UNIT'S ALARM HANDLING PROTOCOL MATCHES THE ONE EMPLOYED IN THE SHIP'S BRIDGE ALERT MANAGEMENT (BAM) SYSTEM. USE OF THE WRONG PROTOCOL MAKES IT IMPOSSIBLE TO REMOTELY ACKNOWLEDGE THE ACTIVE ALARM(S) OR CHECK THE CURRENT ALARM STATUS.** *See paragraph 7.8.2.2 for more information on alarm handling protocol.*

- (9) NEITHER THE MANUFACTURER NOR ITS DEALER IS LIABLE FOR LOSS OF LIFE, BODILY INJURY OR DAMAGE TO THE PROPERTY ARISING FROM THE USE OF THIS EQUIPMENT OR FROM BEING UNABLE, FOR ANY REASON, TO OPERATE THIS EQUIPMENT.**

### **< CAUTION >**

#### **Environmental Safety – Equipment Disposal**

**The display cabinet and the transducer are considered environmentally safe in their original, assembled forms. However, if either unit is to be discarded for any reason, ensure full compliance with all pertinent national/local regulations/ordinances, and contact your dealer or the manufacturer for assistance or instructions before disposing of it.**

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## 2. List of Abbreviations

The abbreviations used in this manual and menus, on the echogram screen, control panel and rear panel are listed below.

ABS:	Acrylonitrile Butadiene Styrene (thermoplastic polymer material)
ACK:	Acknowledgement (header of IEC 61162-1 Ed. 4 command sentence)
ACN:	Acknowledgement (header of IEC 61162-1 Ed. 5 command sentence)
AIS:	Automatic ship Identification System
ALC:	Alert Cyclic List (header of IEC 61162-1 Ed. 5 alert output sentence)
ALF:	Alert (header of IEC 61162-1 Ed. 5 alert output sentence)
ALM:	Alarm (header of IEC 61162-1 Ed. 4/NMEA-0183 alarm output sentence)
A-SCP:	A-Scope display
AUTO:	Automatic control mode (automatic selection of range, gain and TVG)
BAM:	Bridge Alert Management
BR:	Braccia (Italian/Spanish equivalent of fathoms)
BRT:	Brightness control key
BS:	Back Space (shifts character highlight to the left on data entry field)
BSH:	Bundesamt für Seeschifffahrt und Hydrographie (Federal Maritime and Hydrographic Agency, Germany)
BV:	Bureau Veritas (EU NB headquartered in France)
CCW:	Counterclockwise
CLR:	Clear
Corr.:	Corrigendum
CR:	Carriage Return code (cursor control code in software programming)
CW:	Clockwise
D:	Depth (part of cabinet dimensions)
dB:	decibels (unit of relative power strength, $0\text{ dB}\mu=1\text{ }\mu\text{V}$ )
DBK:	Header of IEC 61162-1/NMEA-0183 data sentence (depth below keel)
DBS:	Header of IEC 61162-1/NMEA-0183 data sentence (depth below surface)
DBT:	Header of IEC 61162-1/NMEA-0183 data sentence (depth below transducer)
DFT:	Draft (transducer draft or depth from surface to transducer)
DIM:	Dimmer key
DIN:	Deutsches Institut für Normung (German Institute for Standardization)
DPT:	Header of IEC 61162-1/NMEA-0183 data sentence (depth)
Ed.:	Edition
EN:	Europäische Norm (European Standards)
ENT:	Entry key
ERR:	Error (test result message from self-diagnostic tests)
E/S:	Echo Sounder
ESC/P:	EPSON Standard Code for Printers (printer control protocol)
EU:	European Union
E/W:	East and West
FM:	fathoms (=6 feet)
FRQ, FREQ:	Frequency (transducer frequency)
FT:	feet, foot
FWE:	Flash-memory Write Enable (flash memory programming)
GGA:	Header of IEC 61162-1/NMEA-0183 data sentence (GPS position fix)
GND:	Ground
GPS:	Global Positioning System, GPS receiver/sensor
H:	Height (part of cabinet dimensions)
HBT:	Heartbeat (header of IEC 61162-1 Ed. 5 heartbeat supervision output sentence)
hex:	hexadecimal notation
HH:MM:SS:	Time display format (hours, minutes and seconds)
hr., hrs.:	hour(s)
IBS:	Integrated Bridge System
ID:	Identifier (alert identifier)
IEC:	International Electrotechnical Commission
incl.:	including
INS:	Integrated Navigation System (INS port = RS-422A/B port in this system)
IMO:	International Maritime Organization
ISO:	International Standardization Organization
I/O:	Input/Output, rear-panel I/O connector

## 2. List of Abbreviations *(continued – 2/2)*

KL:	Keel offset (depth from transducer to keel)
KT, KTS:	knot(s)
LAT/LON:	Latitude/Longitude coordinates
LCD:	Liquid Crystal Display
LED:	Light-Emitting Diode
LF:	Line Feed code (cursor control code in software programming)
LST:	Local Standard Time
m:	meters
max.:	maximum
MED:	Marine Equipment Directive (EU directive)
min.:	minutes, minimum
MM/DD/YY:	Month, Day and Year (date indication format)
MTW:	Header of IEC 61162–1/NMEA–0183 data sentence (water temperature)
NB:	Notified Body (EU notified body)
NC:	No Connection (no internal connection)
NMEA:	U.S. National Marine Electronics Association
NR:	Noise Reduction
N/S:	North and South
OEM:	Original Equipment Manufacturing
par., para.:	paragraph
PF:	Picture Feed (echogram feed rate, plotting speed)
PLBK:	Playback (review history of soundings and other data stored in memory)
PWR:	Power
ref.:	refer to, reference is made to
rms:	root mean square (definition of effective mean power)
RA:	Device identifier assigned to radar in IEC 61162–1/NMEA–0183 sentence
REV, Rev.:	Revision (revised firmware version)
RF:	Radio Frequency (transducer frequency in this manual)
RGB:	Red, Green and Blue (3 original colors of light)
RH:	Relative Humidity
RMC:	Header of IEC 61162–1/NMEA–0183 data sentence (position, speed, time)
RMRS:	Russian Maritime Register of Shipping РОССИЙСКИЙ МОРСКОЙ РЕГИСТР СУДОХОДСТВА
RNG:	Range (depth range)
RRR:	Russian River Register Российский Речной Регистр
RX:	Receive, receiver
RXD:	Receive Data
SD:	Device identifier assigned to echo sounder in IEC 61162–1/NMEA–0183 sentence
sec.:	seconds
SPST:	Single–Pole–Single–Throw (on/off switch)
STB:	Starboard, Strobe signal (signal to time data accessing in digital systems)
STC:	Sensitivity–Time Control (time–based receiver gain control method)
STD, Std.:	Standard(s)
STG, stg.:	Steering, steering compass
TEMP:	Temperature
TFT:	Thin–Film Transistor (manufacturing technology of color LCD)
TÜV SÜD:	EU NB (headquartered in Germany for wheel mark certification)
TVG:	Time–Varied Gain control
TX:	Transmit, transmitter
TXD:	Transmit Data (Send data)
USCG:	United States Coast Guard
UTC:	Universal Time Coordinated (= GMT in common usage)
VER, Ver.:	Version (firmware version)
VGA:	Video Graphics Array (display screen resolution, 640×480 pixels)
VRM:	Variable Range Marker
VTG:	Header of IEC 61162–1/NMEA–0183 data sentence (heading and speed)
W:	Width (part of cabinet dimensions), watts
Z:	GMT (mainly in military usage)
ZDA:	Header of IEC 61162–1/NMEA–0183 data sentence (UTC & date)

### 3. Password-Protecting the Menu Settings

#### 3.1. Introduction

- To prevent an unauthorized change in menu settings you have made, a 4-digit user-definable password can be set.
- Once a password is set, every time you press **MENU** to check or change some settings, a password entry window will pop up, asking you to enter the password before you can open the **MAIN MENU**.

#### < WARNING >

- **BEFORE INITIALLY ENTERING THE DESIRED PASSWORD, BE SURE TO TAKE A NOTE OF IT, AND, IF NECESSARY, ADVISE ONLY AUTHORIZED USERS OF IT.**
- **FOR SECURITY REASONS, THE MANUFACTURER CANNOT HELP BREAK A USER-ENTERED PASSWORD.**

#### 3.2. Setting a Password

- It is assumed that a normal echogram screen is showing with no menu turned on.

Figure 3-1 Password Entry Window

- (1) While holding down **CLR** until two beeps are heard, press both **MENU** and **ENT** simultaneously.
  - A password entry window should then show up, as illustrated at right.
- (2) Enter the desired password consisting of 4 numerals, by pressing the appropriate numeric keys.
  - Each character entered will be replaced by an asterisk ( \* ) for security reasons.
  - An entry mistake can be erased by pressing **▲**.

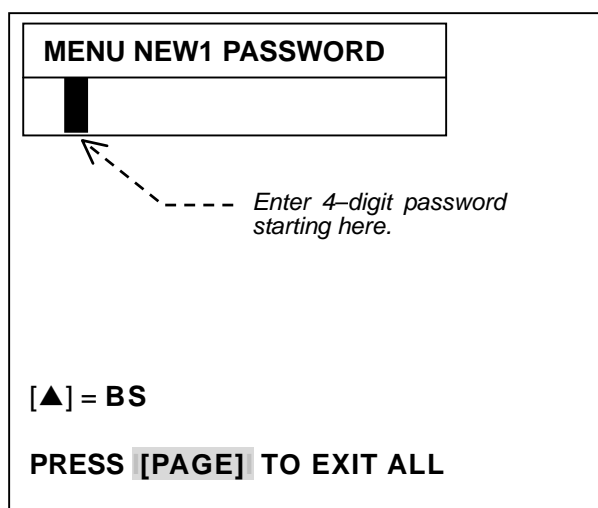
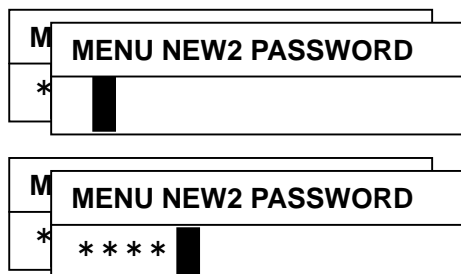


Figure 3-2 Entering Password

- (3) Press **ENT**.
  - The password entry field should then change as shown at right, asking you to enter the same password again.
- (4) Re-enter the same password in the same manner.
- (5) Press **ENT**.
  - The window will then be turned off, allowing the echogram screen to return.
  - If an incorrect password was entered at step (3), the first password entry field (1) will return.



### 3. Password-Protecting the Menu Settings *(continued – 2/2)*

#### 3.3. Changing or Removing the Password

- If you wish to change the current password or remove the password to allow free access to the menu system, execute the following steps:

Figure 3-3 Password Initialization Window

- (1) Display a password initialization window by pressing both **MENU** and **ENT** simultaneously while holding down **CLR**, as in the figure at right.

**MENU OLD PASSWORD**

Enter current password.

[▲] = BS

PRESS [PAGE] TO EXIT ALL

Figure 3-4 Changing/Removing Password – 1/2

- (2) Enter the current (existing) password and then press **ENT**.
  - The password field will change as shown at right.

**MENU NEW1 PASSWORD**

\*

Figure 3-5 Changing/Removing Password – 2/2

- (3) Enter a new password if you wish to change the current one, or simply press **ENT** to remove the current password.
  - The password field will change as shown at right.

**MENU NEW2 PASSWORD**

\*

- (4) Re-enter the new password and press **ENT** (or press **ENT** one more time to remove the password).
  - The password entry window will then be turned off.
  - This completes the menu password change/removal procedure.



#### 4. Standard Components and Parts Supplied

- The following components and parts are initially supplied as standard for each unit of the **CVR-010** echo sounder, unless otherwise prearranged under a separate agreement with your dealer or the manufacturer.
- Upon receipt of the package, check your delivery against the list below and notify your dealer or the manufacturer immediately if any part is found missing.

Table 4-1 List of Components and Parts Supplied as Standard

No.	Name and Description	Part No./Rating/Specs.	Q'ty
1	Echo sounder display unit	CVR-010	1 pc
2	Mounting bracket	SF-STD01	1 pc
3	Cabinet clamping knob	KG-B3/M8X15*1	2 pcs
4	Power cable	M402-PW01*2	1 pc
5	Fuse (for 24V DC and up)	2A, 5.2X20mm, slow-blow	2 pcs
6	Fuse (for 12V DC)	3A, 5.2X20mm, slow-blow	2 pcs
7	2-pin plug (for <b>ALARM ACK</b> receptacle)	CP111-2P*1	1 pc
8	6-pin plug (for <b>ALARM OUT</b> receptacle)	CP111-6P*1	1 pc
9	8-pin plug (for <b>I/O</b> receptacle)	CP111-8P*1	1 pc
10	3-pin plug (for <b>TRANSDUCER</b> receptacle)	HS21P-3*1	1 pc
11	User's manual (this publication)	OPERATION MANUAL	1 copy

\*1: *Equivalents may be supplied, depending on availability or production lot.*

\*2: *Factory-terminated in 3-pin plug (part # CP111-3P) at one end*

## 5. Product Description

- The Model **CVR-010** is a single-frequency navigation echo sounder designed to comply fully with IMO Resolution MSC.74(69) Annex 4, and is type-approved by BSH on the basis of compliance with DIN EN ISO 9875 and relevant IEC requirements for wheel mark certification.
- Featuring a 5.7-inch daylight-viewing, LED-backlit color TFT LCD screen, the equipment displays the echogram using a total of seven user-definable ease-on-the-eye analog strength-level colors that represent various layers of the bottom stratum. The display can be set to show the bottom contour alone in a single color via a menu-guided procedure.
- Digital depth readout is also available using easy-to-read large fonts with a clear on-screen indication of the reference of measurement (from the waterline, the transducer or the keel), and in meters, fathoms or feet. To comply with the IMO resolution, the depth reading must be indicated in meters for navigational purposes.
- With an optional GPS sensor plugged in or an external GPS data source connected, the ship's LAT/LON coordinates, speed and heading data will also be displayed at the same time.
- A battery-backed realtime calendar clock is built in to indicate the date and time in UTC or in the desired local time at all times.
- The built-in alarms include depth alarm, bottom-missing alarm, power failure/low voltage alarm and power removal/shutoff alarm.
- With an appropriate GPS sensor plugged in, or an external GPS-based data source connected, the time is automatically referenced to the atomic-precision GPS time.
- Up to 12 hours of sounding data will be stored in non-volatile memory at approximately two-second intervals, together with associated date and time, range in use plus position coordinates (with an optional GPS sensor plugged in or GPS source connected).
- The user can review the stored data across any 15-minute segment at any point in time over the past 12 hours through a specially designed window easily accessible with a devoted key.
- The depth sounding history can be graphically displayed to show how the depth varied over the past hours. Detailed data is also available digitally via another window that can also be accessed with a single keystroke.
- The data can be output on demand in NMEA-0183 (IEC 61162-1 Ed. 4)- or IEC 61162-1 Ed. 5-compatible format via rear-panel serial interface connectors for use in shore-based applications, and is protected against a system reset.
- An easy-to-use menu system is incorporated to set the transducer draft, depth reference, echo threshold level, echo display mode, etc. in addition to operating parameters to be selected mainly at installation time. Unauthorized access to the menu system can be prevented with a user-definable password, if desired.
- For use with the **CVR-010**, BSH-approved highly energy-efficient single-element **TOKIN** 50 and 200 kHz ceramic transducers are available. The desired frequency should be specified at the time of ordering so that a matched transceiver board is installed in the display cabinet before shipping.
- Both the receiver gain and TVG (anti-clutter) levels are automatically controlled for hands-free operation when the equipment is operating in the fully automatic mode (**AUTO**). Manual override of both functions is also possible.
- Possible interference from other echo sounders operating in the vicinity can be effectively eliminated or reduced with a 3-step noise reduction function.

5. Product Description (*continued – 2/2*)

- The built-in alarms include depth alarm, bottom-missing alarm\*<sup>1</sup>, power failure/low voltage alarm and power removal/shutoff alarm.
- The depth alarm alerts the operator to decreasing depth (shallow alarm). A variable depth marker can be turned on to set the alarm depth graphically as well as digitally.
- The bottom-missing alarm\*<sup>1</sup> warns against the bottom echo being lost, becoming too weak or exceeding the current range limit.
- The power failure/low voltage alarm will be activated if the power line voltage drops below the factory-specified predetermined level.
- The power removal/shutoff alarm will be triggered in the event power is accidentally removed or shut off at the ship's power source with the equipment operating, emitting continuously a repeating beep for several minutes.
- The alarm activation status, except for the power removal/shutoff alarm, will be indicated both audibly and visually, and the alarm on/off switched outputs will be separately available for driving externally connected alarm indicating devices through a devoted connector.
- For bridge alert management (BAM) purposes, the equipment outputs the IEC 61162-1 Ed. 5 (2016) format alert-related sentences, or optionally the NMEA-0183 (IEC 61162-1 Ed. 4)-format alarm sentences, for each alarm via the rear-panel **RS-422-A/B** and **I/O** serial interface ports at specified intervals.
- When any of the alarms becomes active, the output's status and intervals will be changed accordingly, and the active alarm can be remotely acknowledged and reset with an appropriate software command from an INS/BAM terminal or can be manually acknowledged with a suitable hardware on/off switch mounted at a convenient, different location.
- Previously delivered units already installed on-board can be updated through the authorized dealers to comply with the IEC 61162-1 Ed. 5 communications protocol standard regarding the bridge-centered alarm handling procedure.
- The display cabinet has a built-in switch-mode regulator-based efficient DC power supply that assures reliable operation against a wide range of voltage fluctuations.
- In an installation where an AC power source is available, the equipment can be operated primarily from the AC source through an optional **Model AC-2000** AC adapter for an automatic changeover to the DC power source in the event of AC power outage.

6. <sup>1</sup>: *This alarm is available if the alarm handling protocol is optionally set to the **ALR, ACK TYPE** (IEC 61162-1 Ed. 4). See paragraph 7.8.2.2.1 for details.*

## 6. Specifications

### 6.1. General Specifications

- **Display Screen:** 5.7 inch 7–analog RGB-color LED–backlit TFT–LCD, QVGA resolution, with backlighting level adjustable in 10 steps  
- The LCD module complies with IEC 62288 (Ed.2.0, 2014) standard.
- **Data Storage:** Up to 12 hours of soundings data, depth range, associated UTC date/time and LAT/LON readouts\*<sup>1</sup> are automatically retained in flash memory protected from power shutoff or system reset.
- **Data Retrieval:** Stored soundings data (IEC 61162–1/NMEA–0183 DPT format) of past 15 minutes, 1/3/6/12hours can be retrieved from the internal flash memory and can be graphically displayed in a devoted soundings data history window, together with associated UTC date/time and LAT/LON coordinates\*<sup>1</sup>.  
- All stored data can be output in NMEA proprietary format on demand via all rear–panel **RS-422-A/B** and **I/O** serial interface ports simultaneously.
- **Keypad Backlighting:** Adjustable in 7 steps by front panel dimmer key
- **Cabinet Size & Weight:** 248/196(W) × 216/196(H) × 102(D) mm with/without mounting bracket, 1.6 kg (cabinet) + 0.55 kg (mounting bracket)
- **Power Requirements**\*<sup>3</sup>: 11 – 40 VDC, 0.8A at 12V, 0.4A at 24V (typical)  
Power consumption: less than 10W
- **Ambient Temperature:** –15 to +55° C, 95% RH (operating, without condensation)  
–40° C (storage)
- **Compass Safe Distance:** 1.00m (standard compass), 0.55m (steering compass)
- **Waterproofing:** IPX4 (protected equipment category under IEC 60945–2002)
- **Recycling:** Class **IV**

\*<sup>1</sup>: Optional GPS sensor or GPS data source (NMEA–0183) required

\*<sup>2</sup>: AC operation available with optional **AC-2000** adapter connected

\*<sup>3</sup>: Depth Range:20 m, screen brightness: maximum

### 6.2. Echo Sounder Specifications

- **Modes of Operation:**
  - **AUTO** (default): Fully automatic selection and settings (depth range, gain, TVG)
  - **MANUAL:** Manual selection and settings of above parameters
- **Depth Ranges (Maximum Range Limits):**

	A	B	C	D	E	F	G	H
▪ Meters ( <b>m</b> , default):	5	10	20	40	100	200	400	800
▪ Fathoms ( <b>FM</b> ):	2.5	5	15	20	40	100	200	400
▪ Feet ( <b>FT</b> ):	20	40	100	200	400	1000	2000	4000
- **Transducer Draft:** Adjustable in 0.1–meter steps for each transducer
- **Keel Offset:** Adjustable in 0.1–meter steps for each transducer

## 6.2. Echo Sounder Specifications *(continued – 2/4)*

### ■ Transducer Frequencies (and BSH-Approved Matched Transducers):

- 50 kHz (**TOKIN TGM60-50-20L**)
- 200 kHz (**TOKIN TGM80-200-20L**)

### ■ Transmit Power: Approx. 600W RMS max.

### ■ Transmit Pulse Lengths (in milliseconds):

	A	B	C	D	E	F	G	H
▪ Meters ( <b>m</b> ) :	0.14	0.3	0.6	1.1	2.7	5.4	5.4	5.4
▪ Fathoms ( <b>FM</b> ):	0.14	0.3	0.6	1.1	2.7	5.4	5.4	5.4
▪ Feet ( <b>FT</b> ):	0.14	0.3	0.6	1.1	2.7	5.4	5.4	5.4

### ■ Sounding Rates (per minute):

	A	B	C	D	E	F	G	H
▪ Meters ( <b>m</b> ) :	120	120	120	120	60	30	30	30
▪ Fathoms ( <b>FM</b> ):	120	120	120	120	120	60	30	30
▪ Feet ( <b>FT</b> ):	120	120	120	120	60	30	30	30

### ■ Velocity Standard: 1500.0 meters/second; fixed

### ■ Minimum Detectable Depth:

- 50 & 100 kHz: 1 meter
- 200 kHz: 50 centimeters

### ■ Accuracy of Measurement:

- 20-meter range: Better than  $\pm 0.5$  meters
- 200-meter range: Better than  $\pm 5$  meters
- Other ranges: Better than  $\pm 2.5\%$  of digital depth readout

### ■ Range Discrimination:

- 20-meter range: 5 mm/m
- 200-meter range: 0.5 mm/m

- ### ■ Echogram Presentation: The bottom echo is initially displayed in red only.
- It can be displayed in up to 7 analog RGB colors through the menu system, depending on strength, with red representing the strongest echo level and blue, the weakest level (=default settings).
  - Color-strength assignments can be user-defined.

- ### ■ Display Duration: The displayed echogram remains on screen for approximately 20 minutes.

- ### ■ Echogram Feed Rate: Once every 2 seconds; e.g. once every 4 soundings on range below 40m and every 2 soundings on 100m range

- ### ■ Echo Dynamic Range: Change in echo indication to next stronger/weaker color normally represents a 3-dB change in strength.
- Other selectable dynamic ranges include 4, 5 and 6 dB.

- ### ■ Noise Reduction: 3 steps (low, mid and high), selectable via menu






- ### ■ Receiver Gain: Automatically adjusted for depth range in use; manually adjustable in a total of 41 steps (=level 0 to level 40)

- ### ■ TVG (STC): Automatically adjusted for depth range in use; manually adjustable in a total of 31 steps (=level 0 to level 30)

## 6.2. Echo Sounder Specifications *(continued – 3/4)*

### ■ Audible and Visual Alarms

The following alarms are available and enabled at all times, except for the bottom–missing alarm:

- Depth: Warns against decreasing depth, with alarm triggering depth user–presettable in 0.1–meter steps.
  - Alert ID: 230/IEC 61162–1 Ed. 5 (2016) or
  - Local alarm #: 001/IEC 61162–1 Ed. 4 (2010)
- Audible: Beeps repeatedly at approximately 1–second intervals.
  - The sound can be muted by pressing  or with an appropriate ACN\*1 or ACK\*2 format command via one of the rear–panel **RS-422-A/B** or **I/O** serial interface ports.
- Visual: Blinks repeatedly alarm symbol  and on–screen preset value on red background at approximately 1–second intervals.
- Bottom–Missing: Warns if bottom echo is lost or too weak to measure depth, or if depth exceeds the range limit, for 4 seconds or more.
  - Local alarm #: 002/IEC 61162–1 Ed. 4, initially disabled
- Audible: Beeps repeatedly at approximately 1–second intervals; automatically muted in 5 seconds.
- Visual: Blinks repeatedly on–screen depth readout unit (**m**, **FM** or **FT**) at approximately 1–second intervals.
- Power failure/Low Voltage: Warns against drop of power supply voltage below factory–specified level (11.0 VDC).
  - Alert ID 231/IEC 61162–1 Ed. 5 (2016)
  - Local alarm # 003/IEC 61162–1 Ed. 4 (2010)
- Audible: Beeps repeatedly at approximately 1–second intervals.
  - Sound can be muted by pressing  or with appropriate ACN\*1 or ACK\*2 format command via one of the rear–panel **RS-422-A/B** and **I/O** serial interface ports.
- Visual: Blinks repeatedly alarm symbol  and on–screen voltage readout on red background at approximately 1–second intervals.
- Power Removal/Shutoff: Warns against removal or shutoff of power source. (Audible indication only, in the form of a beep occurring at approx. 1–second intervals for at least 5 minutes)
  - Alarm sound can be silenced by pressing .

### ■ External I/O Interface Specifications *(1/2)*

- Online Data Outputs: IEC 61162–1/NMEA–0183 format data sentences (\$SDDPT\*3, \$SDDBT\*3, \$SDDBK\*4 and \$PSKPDPT\*4) via **RS-422-A/B** and **I/O** serial interface ports simultaneously.
  - With optional GPS sensor plugged into rear–panel **I/O** connector, data sentences \$GPGGA, \$GPRMC and \$GPZDA will be appended to above output strings.
  - All sentences can be separately turned on/off via menu system.
- Output Interval: 1 second

\*1: format compliant with Standard IEC 61162–1 Ed. 5 (default setting)

\*2: format compliant with Standard IEC 61162–1 Ed. 4 (optional setting)

\*3: output in meters only regardless of the depth readout unit in use

\*4: for use with **SKIPPER IR 301** digital depth repeaters

## 6.2. Echo Sounder Specifications *(continued – 4/4)*

### ■ External I/O Interface Specifications *(2/2)*

- **Stored Data Output:** IEC 61162–1/NMEA–0183-compatible proprietary format (\$PJMCN<sup>\*1</sup>) via rear-panel **RS-422-A/B** and **I/O** serial interface ports simultaneously
  
- **Data Inputs:** IEC 61162–1/NMEA–0183 format data sentences (\$GPGBA, \$GPRMC, \$GPVTG and \$GPZDA) via one of rear-panel **RS-422-A/B** or **I/O** serial interface ports
  
- **Alarm Outputs:**
  - **Analog:** 2 channels (for depth alarm and power failure/low voltage alarm), by mechanical relay and solid-state relay via rear-panel 6-pin **ALARM OUT** connector
    - **Mechanical Relay:** Normally-open pair of contacts for depth alarm
      - Pins #3 and #4
      - Contact Ratings: 60V, 1A DC
    - **Solid State Relay 1:** Normally-closed pair of contacts for power failure/low voltage alarm
      - Pins #1 and #2
      - Contact Ratings: 60V, 1A DC
    - **Solid State Relay 2:** Normally-open pair of contacts for acknowledgement output; Pins #5 and #6  
Contact Ratings: 60V, 1A DC
  - **Digital:** Two types of alarm-related sentences are selectable, depending on IEC standard<sup>\*2</sup> applied.
    - IEC 61162–1 Ed. 5: Alert output sentences \$SDALC, \$SDALF and \$SDHBT via rear-panel **RS-422-A/B** and **I/O** serial interface ports
    - IEC 61162–1 Ed. 4: Alarm output sentence \$SDALR via rear-panel **RS-422-A/B** and **I/O** serial interface ports
  
- **Alarm Acknowledgement:**
  - **Analog:** By pressing **CLR** or by shorting two pins together on rear-panel **ALARM ACK** connector with external user-supplied switch
  - **Digital:** Two types of alarm acknowledgement method are selectable, depending on IEC standard<sup>\*2</sup> applied.
    - IEC 61162–1 Ed. 5: By entering \$\_\_ACN format command via one of rear-panel **RS-422-A/B** or **I/O** serial interface ports
    - IEC 61162–1 Ed. 4: By entering \$\_\_ACK format command via one of rear-panel **RS-422-A/B** or **I/O** serial interface ports

<sup>\*1</sup>: Depth data will be output in meters only regardless of the depth readout unit used in soundings.

<sup>\*2</sup>: Initially the IEC 61162–1 Ed. 5 standard is applied. The IEC 61162–1 Ed. 4 standard is to be optionally user-selected. See paragraph 7.8.2.2.1 for details.

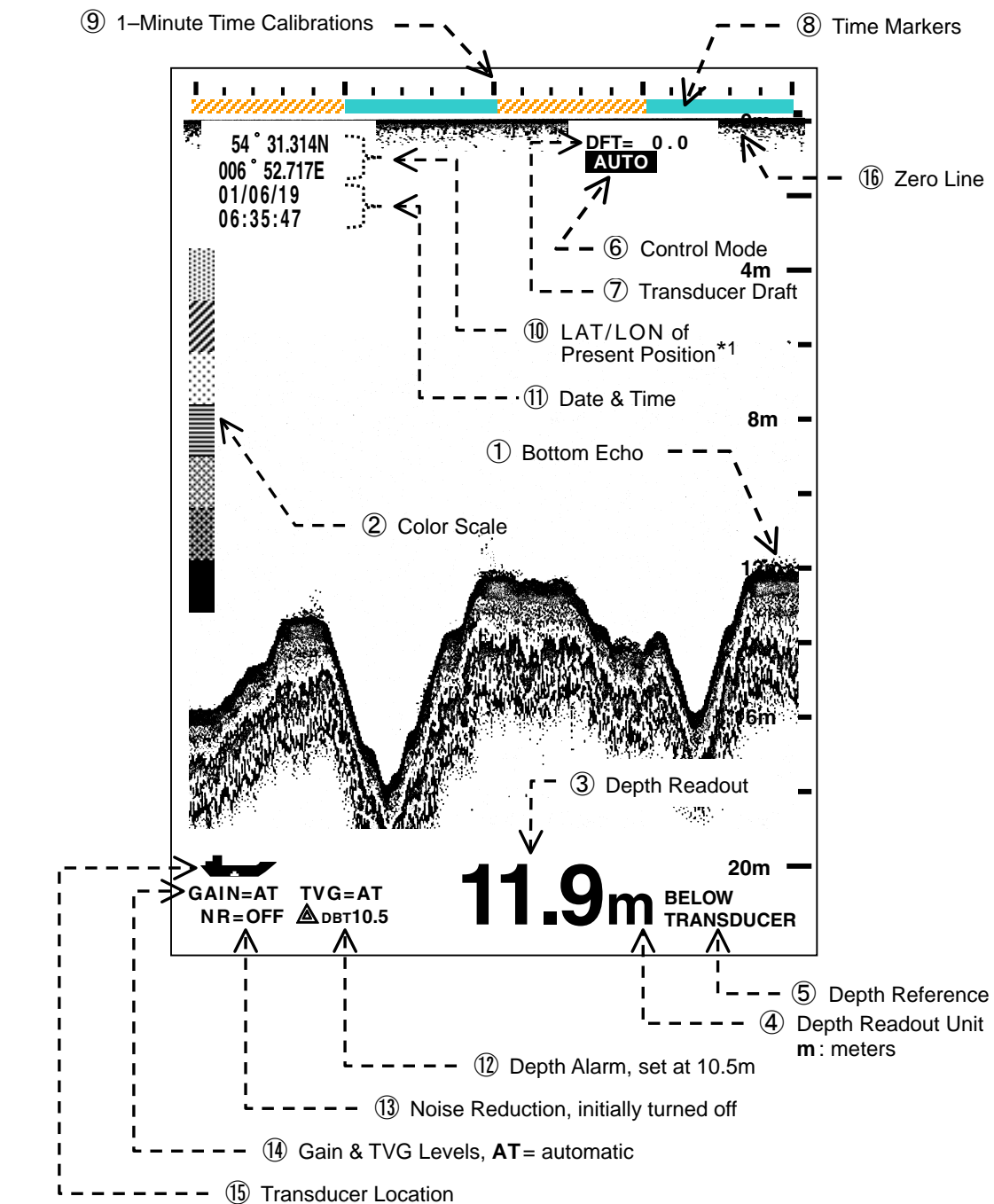
**NOTE:** Specifications other than those stipulated in the relevant IMO resolutions, IEC requirements or EN ISO 9875 standards are subject to change without notice or obligation.

## 7. Basic Operating Instructions

### 7.1. Interpreting Navigation Sounder Screen

- The figure below illustrates a typical operating display showing a full-color bottom topography.
- A brief description of on-screen readouts and objects is given in the following pages.

### Figure 7-1 Typical Full-Screen Full-Color Echogram Display



*\*1: Optional GPS sensor or GPS data source required*



## 7.1. Interpreting Navigation Sounder Screen *(continued – 2/5)*

### ① Bottom Echo

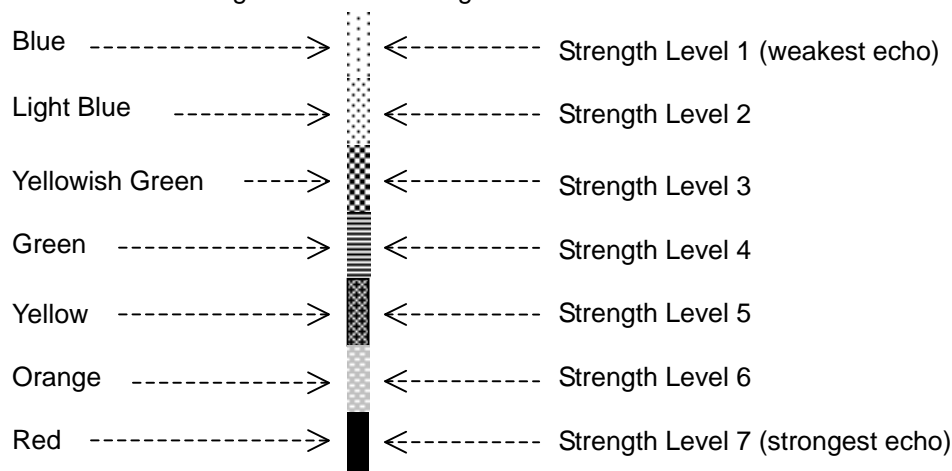
- The bottom echo is shown in up to a total of seven different colors, depending on the strength.
- The colors used to display the echoes are shown on the color scale (②) in order of strength.
- Red, initially at the lower end of the scale, represents the strongest part of the echo (i.e. hardest layer of bottom stratum), and blue initially represents the weakest part (i.e. softest layer of the bottom).
- It is possible to display only the contour of the bottom in a single color via the menu-guided procedure. See paragraph 8.9 for instructions.

### ② Color Scale

- When the echo display\*<sup>1</sup> is set to show echoes in full colors, the colors used to display various echo strength levels are listed here in order of relative strength.
- The color that represents the strongest level is initially red, and the one that represents the weakest level is initially blue.
- The intervening colors simulate various mid strength levels. See paragraph 8.10.2 for related information.
- An echo must be initially 3 decibels (dB) stronger or weaker than the adjacent strength level before it can be displayed in next stronger or weaker color. See paragraph 8.10.4 for greater details.

\*1: Paragraph 8.9, **MAIN MENU** → **8:ECHO DISPLAY** → **2:NORMAL DISPLAY**

Figure 7-2 Initial Assignments of Echo Colors



### ③ Depth Readout *(1/2)*

- The depth to the bottom from the selected reference (⑤) is indicated here.
  - Readout Unit: **m**=meters (initial setting), **FM**=fathoms, **FT**=feet
  - Refer to paragraph 8.10.3 for details.

#### < CAUTION >

**To comply with IMO resolution MSC.74(69), measurements must be made in meters for navigational purposes.**

- To obtain a continuous readout, the bottom echo (①) must be displayed in red, orange or yellow (or three user-defined strongest echo colors). This is automatically accomplished when you are operating the unit in the fully automatic control mode (**AUTO**, ④).

## 7.1. Interpreting Navigation Sounder Screen *(continued – 3/5)*

### ③ Depth Readout (2/2)

- If you are operating the unit in the manual control mode (**MANUAL**, ④), adjust the appropriate gain control accordingly.
- The TVG level may also have to be adjusted to prevent surface clutters from disturbing depth reading. See paragraph 7.6.
- If the bottom echo is lost or too weak to measure depth continuously for 4 seconds or more, (or if the depth exceeds the current range limit continuously for 4 seconds or more when in the manual control mode), the bottom-missing alarm will be triggered, blinking the current readout unit on a red background with digital readout turned off, and emitting a beep at approx. 1-second intervals.
- To rectify this situation, activate the manual control mode, and increase the receiver gain or select a greater range.
- This function is not available when the communications protocol is set to the IEC 61162-1 Ed. 5 standard. See paragraph 7.8.2.2.1 for related information.

### ④ Depth Readout Unit

- The unit used in reading the current depth is indicated here.
  - **m**=meters (initial setting), **FM**=fathoms, **FT**=feet
- Refer to paragraph 8.10.3 for details.
- The stored soundings data will be in meters regardless of the readout unit indicated.

#### < CAUTION >

**To comply with IMO resolution MSC.74(69), measurements must be made in meters for navigational purposes.**

### ⑤ Depth Reference

- The reference to which measured depth is to be referred is indicated here.
  - **BELOW TRANSDUCER**: Depth referred to transducer (initial setting), **DBT**
  - **BELOW SURFACE**: Depth referred to surface (waterline), **DBS**
  - **BELOW KEEL**: Depth referred to ship's keel, **DBK**
- See paragraph 8.3 for details.

### ⑥ Control Mode (**AUTO/MANUAL**)

- The control mode can be changed from/to **AUTO/MANUAL** by pressing **AUTO**. The selected mode is indicated here.
  - **AUTO**=fully automatic control mode
  - **MANUAL**= manual control mode

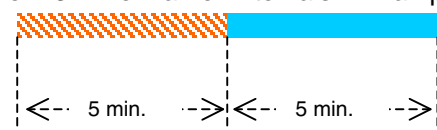
### ⑦ Transducer Draft (**DFT= X.X**)

- The distance between the water surface and the transducer face, i.e. transducer draft, is indicated.
- The draft can be entered directly by pressing **DRAFT**, followed by **▲/▼**, or via the menu system (**MAIN MENU → 1:TRANSDUCER DRAFT**).
- See paragraph 8.2 for details.

Figure 7-3 Time Marker Intervals – Example

### ⑧ Time Markers

- An orange marker and a yellow marker alternately show up at 5-minute intervals on any depth range, as in the example at right.
- By counting the number of markers, you can check an approximate time period elapsed across a particular horizontal segment on the echogram screen.



## 7.1. Interpreting Navigation Sounder Screen *(continued – 4/5)*

### ⑨ One-Minute Time Calibrations

Figure 7-4 One-Minute Time Calibrations

- These graduations are displayed at one-minute intervals, allowing you to check the time passage to 1 minute across a given segment of the echogram.








### ⑩ LAT/LON of Present Position

- When an optional GPS sensor is plugged into the rear-panel **I/O** data connector or when a position data signal from other GPS receiver is fed to that connector, the equipment will display the latitude/longitude coordinates of your present position here and will store the position data in non-volatile memory along with digital depth reading and associated date/time data.

### ⑪ Date and Time

- Date is shown in DD/MM/YY(month/day/year) format.
- Time is in 24-hour HH:MM:SS (hours: minutes: seconds) format, and is UTC unless a local time offset is entered. See paragraphs 8.10.5 and 8.10.6 for date/time preset instructions.
- With an optional GPS sensor plugged in, or a GPS data source connected, the time will be automatically synchronized with the GPS time.

### ⑫ Depth Alarm

- The alarm depth is indicated here. The abbreviation to the right of the  symbol indicates the depth reference used in setting the alarm depth. See paragraph 8.3 for more information on the reference.
  - **DBT**: depth below transducer (initial setting)
  - **DBS**: depth below surface
  - **DBK**: depth below keel
- As soon as the current depth decreases beyond that value, the depth alarm will be triggered.
- The alarm depth can be set via the following summarized steps.
  - Turn on the Variable Range Marker (**VRM**) by pressing .
  - Repeatedly press / to place the **VRM** at the desired alarm depth.
  - Press .
- See paragraph 7.8.3 for greater details.





### ⑬ Noise Reduction Level, **NR = OFF/LOW/MID/HIGH**

- Echo sounders operating nearby or other onboard electronics can become a source of interference.
- Noise reduction (**NR**) is the action of preventing such interfering signals from cluttering the operating screen.
- The following **NR** levels can be selected via the menu system\*1:
  - **NR=LOW**: Sets **NR** function at low reduction level.
  - **NR=MID**: Sets **NR** function at medium reduction level.
  - **NR=HIGH**: Sets **NR** function at high reduction level.
  - **NR=OFF**: Disables **NR** function (initial setting).

\*1: **MAIN MENU** → **4:NOISE REDUCTION**

## 7.1. Interpreting Navigation Sounder Screen *(continued – 5/5)*

### ⑭ Gain and TVG Levels, **GAIN=XX, TVG=XX**

- The receiver gain and TVG levels currently in use are indicated.
- When the equipment is working in the automatic control (**AUTO**) mode, both indications read "**AT**."
- In the case of manual control (**MANUAL**) mode of operation, the current levels are numerically indicated (e.g. **GAIN=18, TVG=30**).
- The receiver gain level can be manually changed by pressing **GAIN** once, followed by /.
  - The indication **GAIN** is highlighted (**GAIN**) during setting.
- The TVG level can be manually changed by pressing **GAIN** twice first, followed by /.
  - The indication **TVG** is highlighted (**TVG**) during setting.

### ⑮ Transducer Location

- The relative location of the transducer is graphically indicated here.
- See paragraph 8.10.7.2 for greater details.

Figure 7-5 Relative Location of Transducer



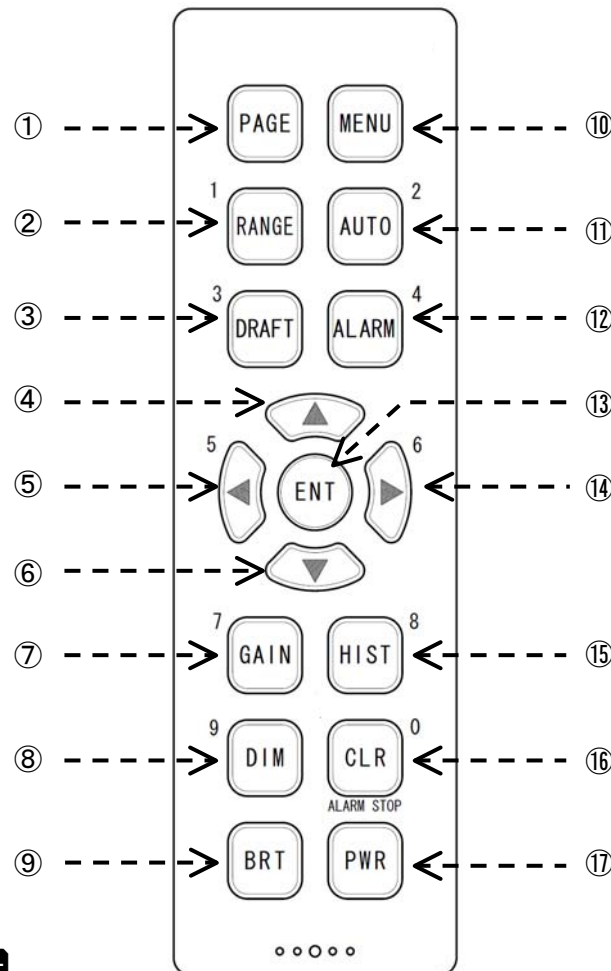
### ⑯ Zero Line

- This (initially red) thick line is caused by a portion of transmitting energy leaking into the receiver, and its upper edge represents the on-screen position of the transducer face.
- When the transducer draft (⑦, depth from waterline to transducer) is entered, the zero line shifts toward the bottom by the amount of the draft.
  - See paragraph 8.2 for details on draft entry.
- When the depth reference is set to "**BELOW KEEL**" with the correct keel offset (distance from transducer to keel) entered, the zero line shifts above scale line 0 by the amount corresponding to the offset, and its display is suppressed intentionally.
  - See paragraph 8.10.7.3 for details.

## 7.2. Control Panel Functions

- The figure below shows the control panel of the equipment. A summary description of the functions the keys and controls provide is given below and on the following pages.

Figure 7-6 Control Panel





### ① Page Key **PAGE**

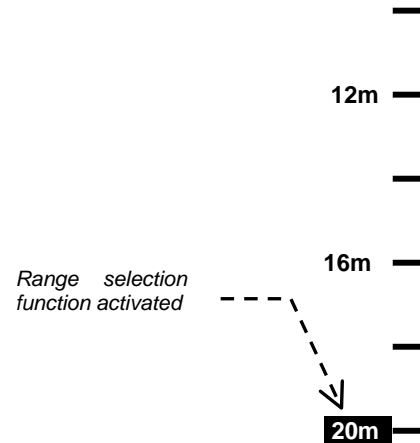
- Pressing this key opens a data logging (**LOG**) window on the echogram screen to show up to 17 pages of list of stored data including soundings and their associated dates and times plus position coordinates (with an optional GPS sensor plugged in).
- Each page carries a total of 9 sets of data. To turn the page forward, press . To turn it backward, press . See paragraph 7.7.4 for details.
- A second keypress closes the window.
- When a menu or a number of menus are open, pressing this key will close all menus at a time, returning you to the normal echogram screen.
- Turning the equipment on while holding down this key opens a **SYSTEM MENU**, enabling you to:
  - select echogram background colors;
  - perform a self-diagnostic test;
  - output stored data to PC-based applications;
  - select menu languages;
  - select alarm handling protocols for INS BAM applications; and
  - set the optimum TVG response depending on the transducer installed.
- See Section 9 (Making Settings via SYSTEM MENU) for details.

## 7.2. Control Panel Functions *(continued – 2/7)*

### ② Depth Range Key

Figure 7-7 Indication of Activating Range Selection Function – Example




- Pressing this key activates the function of depth range selection, highlighting the lower range limit calibration, like the example at right.
- To select a desired range, press  (for greater ranges) or  (for smaller ranges).
- When a menu is open, this key acts as numeric key “1” to enter value 1 or to select menu option 1.

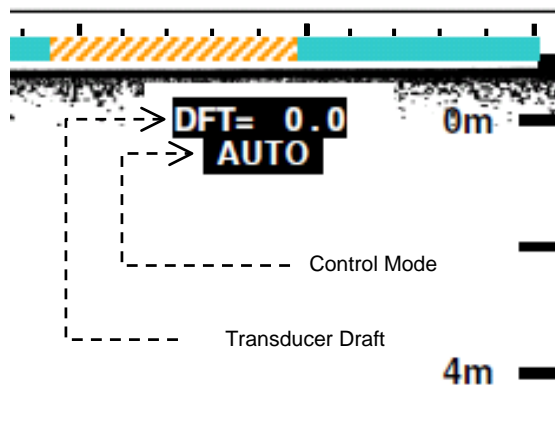


### ③ Transducer Draft Key


- To read depth from the surface or from the keel, the appropriate transducer draft value (i.e. the distance between the waterline and the transducer face) has to be entered.
- The draft is initially set at 0.0 meter (**DFT= 0.0**).

Figure 7-8 On-Screen Operating Parameter Indications – Example

- Pressing this key activates the function of entering the transducer draft.
- The legend “**DFT= 0.0**” just below the upper screen edge will be highlighted, like the example at right.
  - To enter the draft, press  / .
  - To exit the mode, press  again.
- When a menu is being opened, this key acts as numeric key “3” to enter value 3 or to select menu option 3.




### ④ Up Key

- On normal echogram screen with no menu opened, pressing this key will result in an operational error, causing the unit to beep three times in quick succession.
- When the variable range marker (VRM) is turned on, pressing this key moves the marker upward (i.e. in the shallowing direction).
- When a menu with two or more options is being opened, pressing this key selects those options downward.
  - To finalize selection, press .
- When selecting the depth ranges (②), pressing this key selects smaller ranges.


## 7.2. Control Panel Functions *(continued – 3/7)*

### ⑤ Left Key

- On normal echogram screen, pressing this key will result in an operational error, causing the unit to beep three times in quick succession.
- When a menu is being opened, this key acts as numeric key “5” to enter value 5 or to select menu option 5.
- When the soundings history window (**HISTORY**) is being opened (with ) , pressing this key moves the vertical line cursor to the left on the time passage scale, showing the depth registered at the date and time (and the LAT/LON coordinates\*1) shown just below the scale.

\*1: LAT/LON information is available with an optional GPS sensor or IEC 61162-1-compatible GPS data source plugged into the rear-panel I/O data connector.

### ⑥ Down Key

- On normal echogram screen with no menu opened, pressing this key will result in an operational error, causing the unit to beep three times in quick succession.
- When the variable range marker (VRM) is turned on, pressing this key moves the marker downward (i.e. in the deepening direction).
- When a menu with two or more options is being opened, pressing this key selects those options downward. To finalize selection, press .
- When selecting the depth ranges (②), pressing this key selects larger ranges.

### ⑦ Receiver Gain/TVG Key






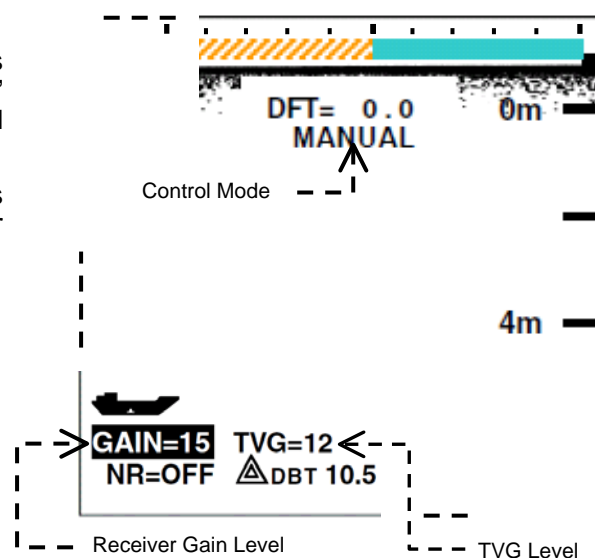
- When the equipment is operating in the automatic control (**AUTO**) mode, pressing this key once changes the control mode to “**MANUAL**,” and highlights gain level indication “**GAIN=XX**” as in the example below.
- You can then adjust the receiver gain level manually by pressing /. The gain level is numerically shown as illustrated below.
- To return to “**AUTO**,” press .

Figure 7-9 Parameter Indication in Manual Control Mode – Example

- Pressing the key twice highlights TVG level indication “**TVG=XX**,” allowing you to set the TVG (initial gain suppression) using /.
- When a menu is being opened, this key acts as numeric key “7” to enter value 7 or to select menu option 7.



## 7.2. Control Panel Functions *(continued – 4/7)*

### ⑧ Dimmer Key

- Pressing this key changes the backlighting level of the keypad in a total of 6 steps. After the lowest level is reached, further keypress returns you to the highest level.
- When a menu is being opened, this key acts as numeric key “9” to enter value 9 or to select menu option 9.

### ⑨ Brightness Key

- Pressing this key adjusts the screen brightness level in a total of 6 steps to suit the ambient lighting condition.

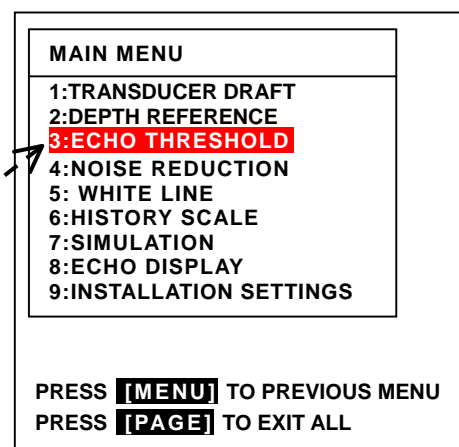
### ⑩ Menu Key

- A first keypress activates the menu system, opening a main menu (**MAIN MENU**), as illustrated at right. A second keypress turns it off.
- The menu system allows you to make various settings that suit your operational requirements.

Option selected  
(highlighted in red background)

- Detailed instructions are given in Section 8 (Advanced Settings).
- Menu options can be selected by pressing appropriate numeric keys. The one that is currently selected is shown highlighted in a red background.

Figure 7-10 **MAIN MENU**



- |                                    |  |
|------------------------------------|--|
| - <b>1:TRANSDUCER DRAFT:</b>       | Enters transducer draft.   |
| - <b>2:DEPTH REFERENCE:</b>        | Selects references to which measured depth is to be referred (i.e., waterline, transducer face or keel).                                     |
| - <b>3:ECHO THRESHOLD:</b>         | Selects weak echo suppression levels.  |
| - <b>4:NOISE REDUCTION:</b>        | Selects noise reduction levels.  |
| - <b>5: WHITE LINE:</b>            | Selects while line gain levels.  |
| - <b>6:HISTORY SCALE:</b>          | Selects time scales when playing back stored data.   |
| - <b>7:SIMULATION:</b>             | Turns on/off built-in echo sounder simulator.  |
| - <b>8:ECHO DISPLAY:</b>           | Selects single color bottom contour only or full color echoes for display.   |
| - <b>9:INSTALLATION SETTINGS:</b>  | Opens a submenu with the following options:  |
| - <b>1:ECHO COLORS:</b>            | Assigns desired colors to echo strength levels.  |
| - <b>2:DEPTH UNIT:</b>             | Selects metric (m), fathom (FM) or footage (FT) readout unit.  |
| - <b>3:DYNAMIC RANGE:</b>          | Selects echo dynamic ranges.   |
| - <b>4:UTC/LST (offset):</b>       | Selects UTC or local standard time (LST).  |
| - <b>5:CLOCK PRESET:</b>           | Presets built-in clock and calendar.   |
| - <b>6:TRANSDUCER SETTINGS:</b>    | Registers transducer location or keel offset.  |
| - <b>7:DATA OUTPUT PORT:</b>       | Selects data outputs for use by external devices.  |
| - <b>8:BOTTOM MISSING ALM:</b>     | Enables/disables bottom-missing alarm.   |
| - <b>9:DEPTH READOUT RESPONSE:</b> | Selects appropriate time periods for holding last valid depth data in bottom-missing condition to avoid frequent bottom searching operation. |
| - <b>0:KEY BEEP SETTING:</b>       | Turns on/off keypress beep.  |

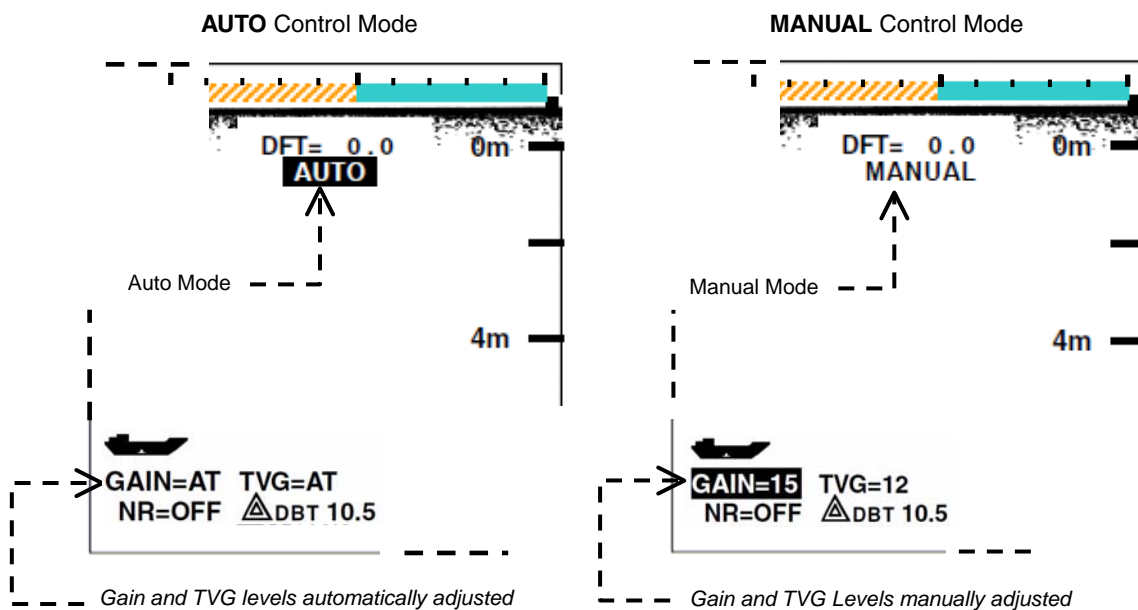


## 7.2. Control Panel Functions *(continued – 5/7)*

### ⑪ Auto/Manual Control Mode Key

- Pressing this key selects two control modes: **AUTO** and **MANUAL**.
- The equipment is initially placed in the **AUTO** mode, selecting depth ranges and adjusting receiver gain and TVG levels automatically so that the bottom echo is always displayed in the lower half of the screen.
- The illustrations below show an example of the on-screen parameters that indicate which mode the unit is currently operating in.

Figure 7-11 Parameter Indications in **AUTO** and **MANUAL** Control Modes – Example



- A first keypress changes the control mode to “**MANUAL**,” allowing manual selection of depth ranges and manual setting of the gain/TVG level.
- See paragraphs ② and ⑦ for the relevant summarized instructions.

### < CAUTION >




When in the manual mode, the receiver gain must be adjusted so that the bottom echo is displayed in red, orange or yellow (or one of the three strongest echo colors, if you have changed the color assignments) for successful digital depth reading.

- If you change the gain or TVG level while in the **AUTO** mode, the unit will be placed in the **MANUAL** mode.
- See paragraph ⑦ for related information.
- A second keypress changes the control back to “**AUTO**.”
- When a menu is being opened, this key acts as numeric key “**2**” to enter value **2** or to select menu option 2.

## 7.2. Control Panel Functions *(continued – 6/7)*

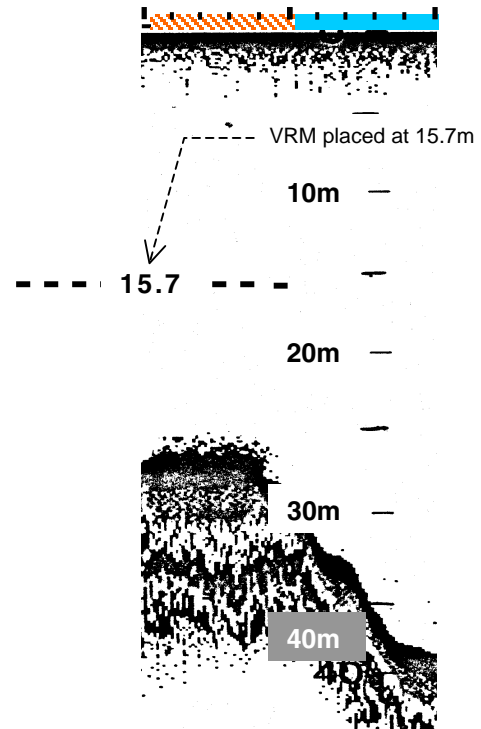
### ⑫ Alarm/VRM Key

Figure 7-12 Variable Range Marker – Example

- Pressing the key once turns on the VRM (variable range marker), a horizontal dotted line with its current position readout, as in the example at right.
- A second keypress turns the VRM off.
- The VRM is used to set the depth for the depth alarm, and can be shifted upward/downward by pressing /.
- Pressing  sets the alarm depth at the VRM position.

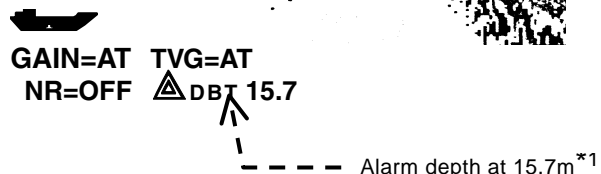
\*1: Alarm depth below transducer (DBT)

- When a menu is being opened, this key acts as numeric key “4” to enter value 4 or to select menu option 4.




### ⑬ Enter Key

- On normal echogram screen with no menu opened or without VRM (⑫) on-screen, pressing this key will result in an operational error, causing the unit to beep three times in quick succession.
- When the VRM is currently showing, pressing this key sets the alarm depth at that position and activates the depth alarm.
- When you are making a setting or selecting menu options, pressing the key completes that setting or finalizes the selection of that option.



### ⑭ Right Key

- On normal echogram screen, pressing this key will result in an operational error, causing the unit to beep three times in quick succession.
- When a menu is being opened, this key acts as numeric key “6” to enter value 6 or to select menu option 6.
- When the soundings history window (**HISTORY**) is being opened (with , ⑮), pressing this key moves the vertical line cursor to the right on the time passage scale, showing the depth registered at the date and time (and the LAT/LON coordinates\*2) shown just below the scale.

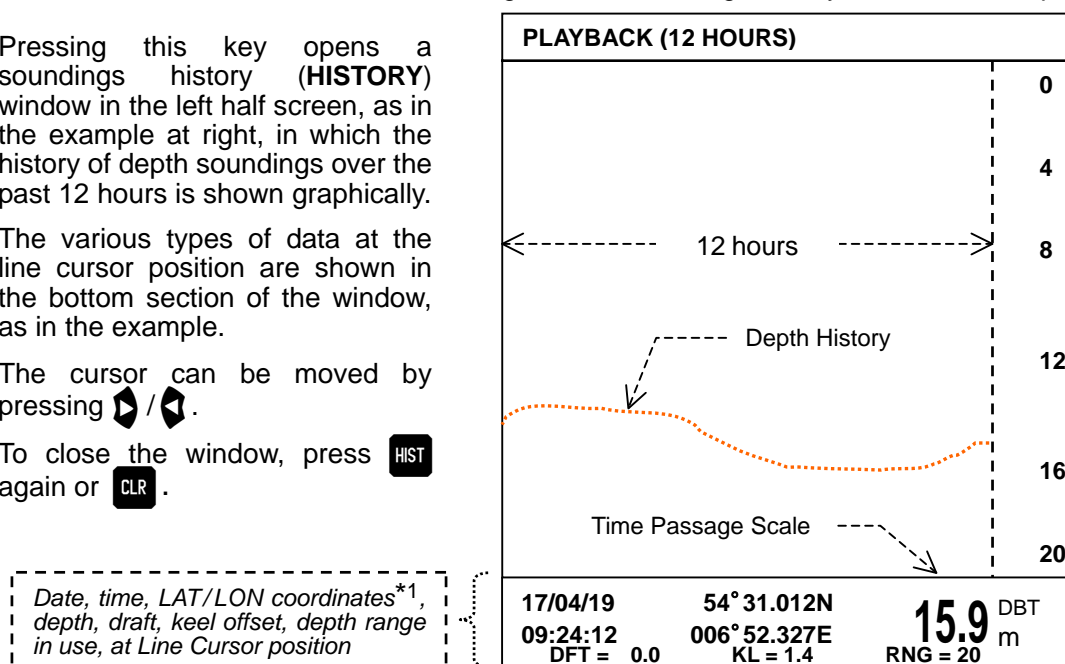
\*2: LAT/LON information is available with an optional GPS sensor or IEC 61162-1-compatible GPS data source plugged into the rear-panel I/O data connector.

## 7.2. Control Panel Functions *(continued – 7/7)*

### ⑮ Soundings History Key **HIST**

- Pressing this key opens a soundings history (**HISTORY**) window in the left half screen, as in the example at right, in which the history of depth soundings over the past 12 hours is shown graphically.
- The various types of data at the line cursor position are shown in the bottom section of the window, as in the example.
- The cursor can be moved by pressing **▲** / **▼**.
- To close the window, press **HIST** again or **CLR**.

Figure 7-13 Soundings History Window – Example



\*1: Optional GPS sensor or GPS data source required.

- The time span, 15 minutes in the above example, can be changed by pressing **▲** / **▼**. The following values are selectable: 5 minutes, 15 minutes, 30 minutes, 1 hour, 2 hours, 3 hours, 6 hours and 12 hours. Refer to paragraph 7.7 for greater details.
- When a menu is being opened, this key acts as numeric key “8” to enter value 8 or to select menu option 8.

### ⑯ Clear/Alarm Stop Key **CLR**

- This key is used to silence the currently active audible alarm(s), including the power removal/shutdown alarm that will be triggered by unplugging the power cable or by switching the power off at the source.
- Pressing the key acknowledges and resets the currently triggered alarm in the same manner as sending an appropriate ACK/ACN command from an INS/BAM terminal through one of the rear-panel serial interface ports (**RS-422-A/B** and **I/O** connectors). Refer to paragraphs 7.8.2 and 13.3.4.5 for details.  
*NOTE: The pair of pins #5 and #6 on the **ALARM OUT** connector will also be closed for 3 seconds.*
- When a menu is being opened, this key acts as numeric key “9” to enter value 9 or to select menu option 9.
- Turning the equipment on while holding down this key resets the system, returning all user-made settings to the factory’s initial settings, while retaining the sounding, date/time data, etc. stored in non-volatile memory. See paragraph 12.5 for details.

### ⑰ Power Key **PWR**



This key turns on/off the equipment. To turn it off, press and hold down the key for a few seconds (until you hear a series of beeps – two slow beeps followed by two quick beeps). This delayed action is intentionally provided to prevent an accidental shutoff.

### < CAUTION >

**Do not turn the unit off by unplugging the power cable or shutting off the ship's power source.**

## 7.3. Selecting Depth Ranges

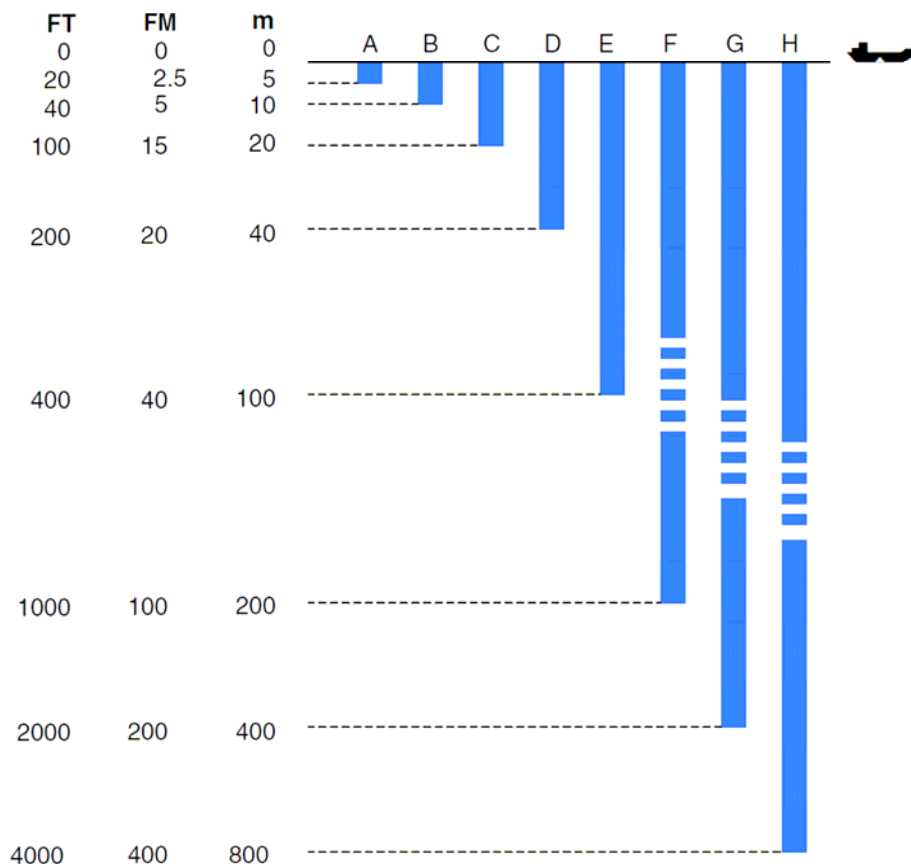
### 7.3.1. Manual Selection

- A total of eight depth ranges are available in meters (**m**), fathoms (**FM**) or feet (**FT**), as illustrated below, and are automatically selected to display the bottom echo and read depth when the unit is working in the automatic control (**AUTO**) mode.
- In applications where you wish to monitor depth on a certain fixed range scale or where you wish to select range scales manually, press **RANGE** first. The control mode will then be switched to "**MANUAL**," (② in paragraph 7.2) and the desired range can be selected by pressing the following pair of keys:
  -  to selects smaller ranges (in H-to-A direction).
  -  to selects larger ranges (in A-to-H direction).
- All depth ranges start at scale line zero (0), unless a transducer draft\*<sup>1</sup> or keel offset\*<sup>2</sup> is entered.
- Select depth ranges so that the bottom echo is displayed, preferably within the lower half part of the screen for ease of monitoring the changing depth graphically.
- If the depth exceeds the current range limit, a bottom-missing alarm will be triggered. See paragraph 7.8.4 for details.

\*1: Paragraph 8.2

\*2: Paragraph 8.10.7.3.

Figure 7-14 Depth Range Arrangement

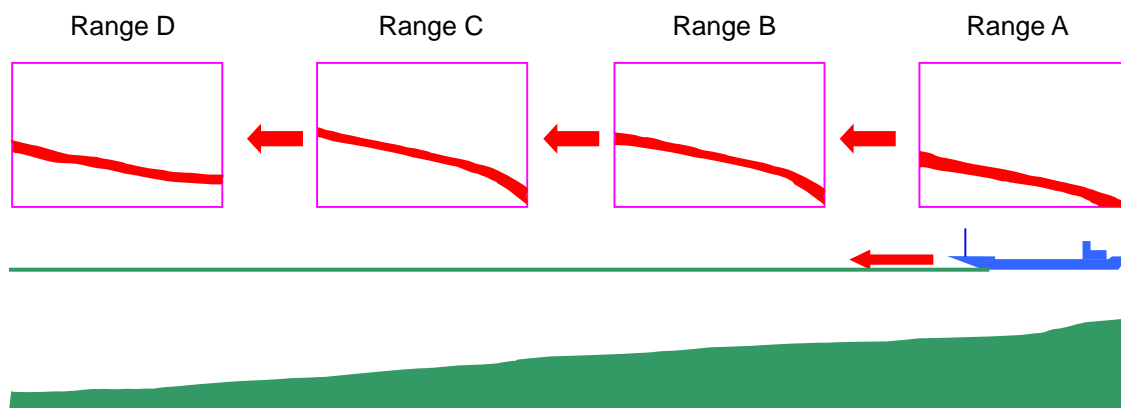


### 7.3.2. Automatic Selection (Automatic Mode of Operation)

- The equipment is initially in the automatic control (**AUTO**) mode, selecting depth ranges, adjusting the receiver gain and TVG levels\*<sup>1</sup> (shallow gain suppression level) – all automatically.
- The bottom echo will remain displayed in the lower half screen area regardless of changes in depth.
- Pressing **AUTO** will switch the control to the manual mode (**MANUAL**).  
- A second keypress will switch it back to “**AUTO**.”
- The figure below illustrates an example of how depth range selection occurs with this mode activated, as you travel over a gradually deepening bottom.
- As soon as the bottom shows up at the lower end of the scale lines on the current depth range, the next greater range will be automatically selected.
- When traveling over a gradually shallowing bottom, the range selection sequence is reversed.
- As soon as the bottom is registered in the upper half screen, the next smaller range will be switched in.

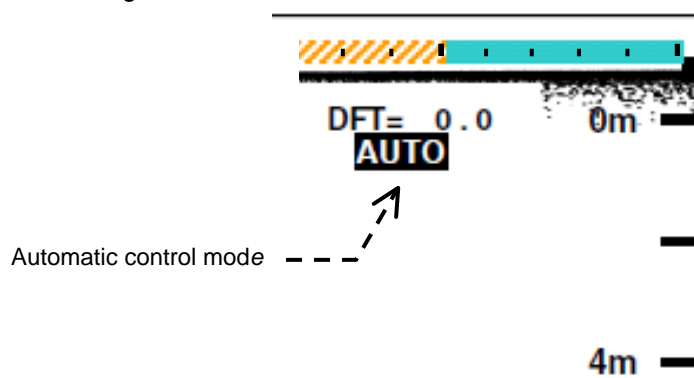
\*1: TVG: Time-varied gain. This function, which sharply reduces the receiver gain at the start of each sounding and gradually recovers the normal gain level with time, is used to prevent surface clutters and other noise-producing reflections near the surface from disturbing depth measuring operation.

Figure 7-15 Automatic Depth Range Selection – Example



- On-screen status indication “**AUTO**” will be turned on highlighted as in the example below to indicate that the unit is currently operating in the automatic control mode.

Figure 7-16 On-Screen Indication of Automatic Control Mode



## 7.4. Interpreting Echo Display

### 7.4.1. Bottom Echo in Full Colors

- The equipment normally shows only the strongest part of the bottom echo in a single color (initially red).
- Echoes including the bottom reflection can however be displayed in up to a total of seven different colors – initially, red, orange, yellow, green, yellowish green, light blue and blue, which represent the various layers of the bottom stratum in order of strength – via the procedure\*1 given in paragraph 8.9; namely, red represents the strongest level, and blue, the weakest one.
- A colored bar (termed “color scale” in this manual) located at the left end of the screen indicates the colors that are currently assigned to display echoes, as in the illustration below.

\*1: **MAIN MENU** → **8:ECHO DISPLAY** → **2:NORMAL DISPLAY**

Figure 7-17 Initial Assignments of Bottom Echo Colors

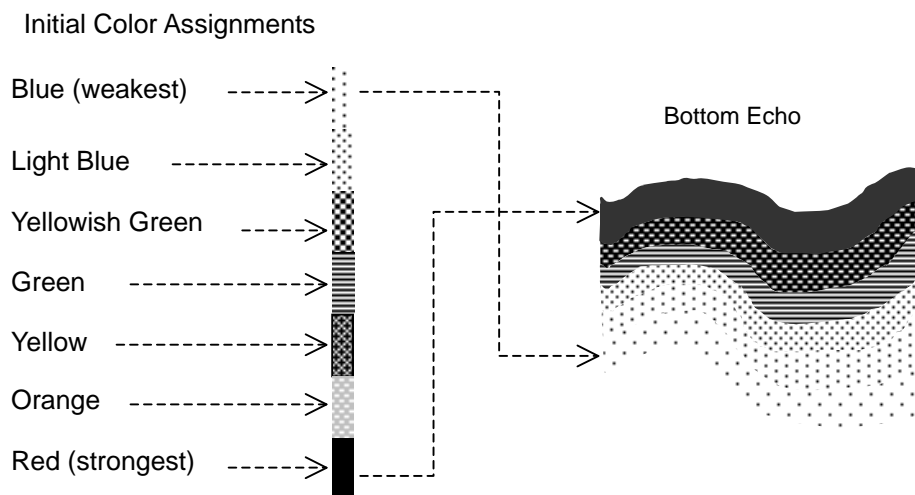
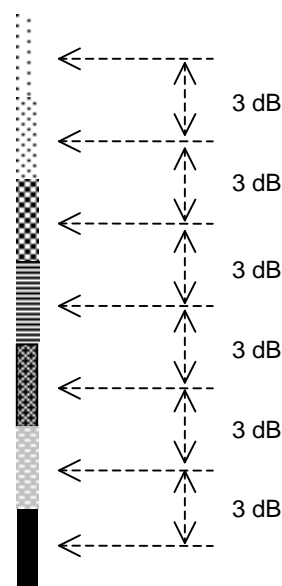


Figure 7-18 Initial Echo Dynamic Range

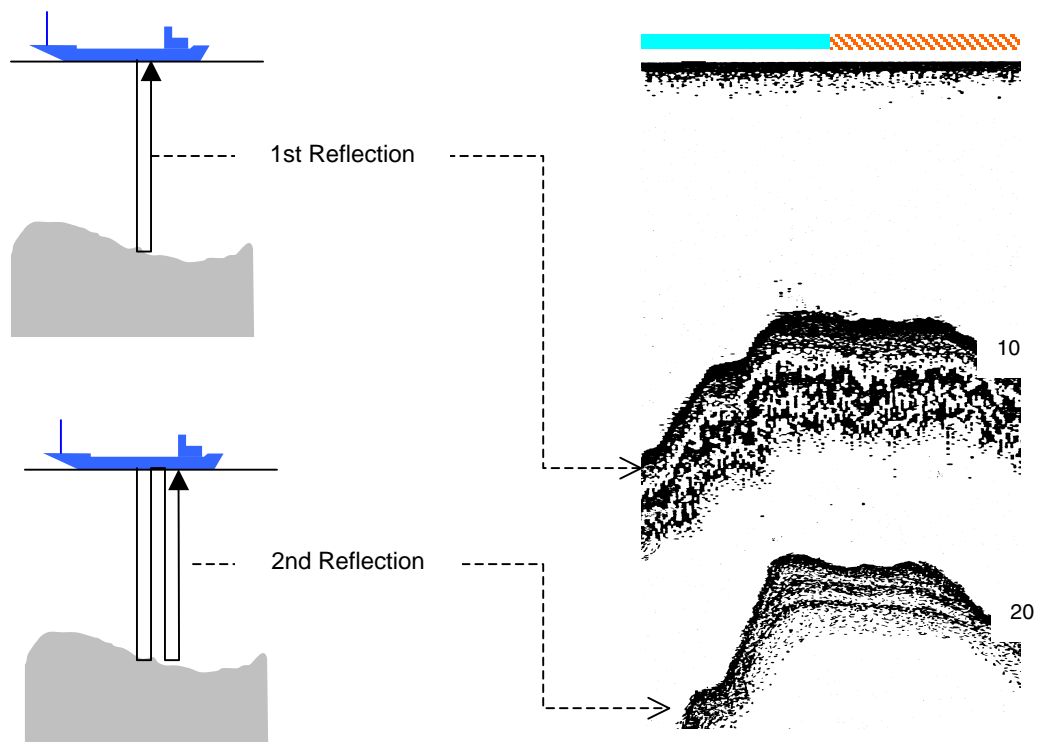
- You can change those color assignments by selecting from a total of 10 different colors provided.
- See paragraph 8.10.2 for instructions.
- There is initially an approximately 3 dB difference in strength between two adjacent colors, as illustrated in the figure at right, meaning that a particular color is approx. 1.4 times stronger or weaker than either adjacent color.
- This difference, termed "echo dynamic range," can be changed to suit various bottom conditions (hard, soft, muddy, etc.).
- See paragraph 8.10.4 for instructions.



#### 7.4.2. Multiple Bottom Echoes

- When navigating a shallow water area, you may observe a bottom-like echo at twice the present depth, and sometimes also at three or four times the depth.
- This multiple echo phenomenon occurs when the first echo is reflected back and forth a number of times between the water surface and the bottom like reverberations.
- In the case of the example below, a first reflection, which is used to register the depth, is bounced back to the bottom, and then back again to the transducer as a second reflection, thereby causing that echo to be recorded at twice the depth.
- The appearance of multiple bottom echoes indicates that the bottom is relatively hard.

Figure 7-19 Display of Multiple Bottom Echoes – Example



- The effect of multiple reflections may be reduced by decreasing the receiver gain (through gain and/or TVG adjustment, paragraphs 7.5 and 7.6) when you are operating the unit in the manual control (**MANUAL**) mode\*<sup>1</sup>.
- Occasionally a large school of fish or a temperature layer can also cause the equipment to lock onto it, thus producing an incorrect digital depth readout.

\*<sup>1</sup>: Pressing **AUTO** switches the control between automatic mode and manual mode. When the unit is in the automatic control (**AUTO**) mode, attempting to change the receiver gain or TVG level also changes the mode to "**MANUAL**."

- Whenever you have any doubt about the validity of digital depth reading, check the depth graphically against the on-screen scale calibrations to determine whether the current digital readout is valid or not.
- **A special caution should be exercised when using digital depth information while in shallow water operation, because the second echo may be tracked for depth measurement, resulting in a digital readout twice the actual depth.**

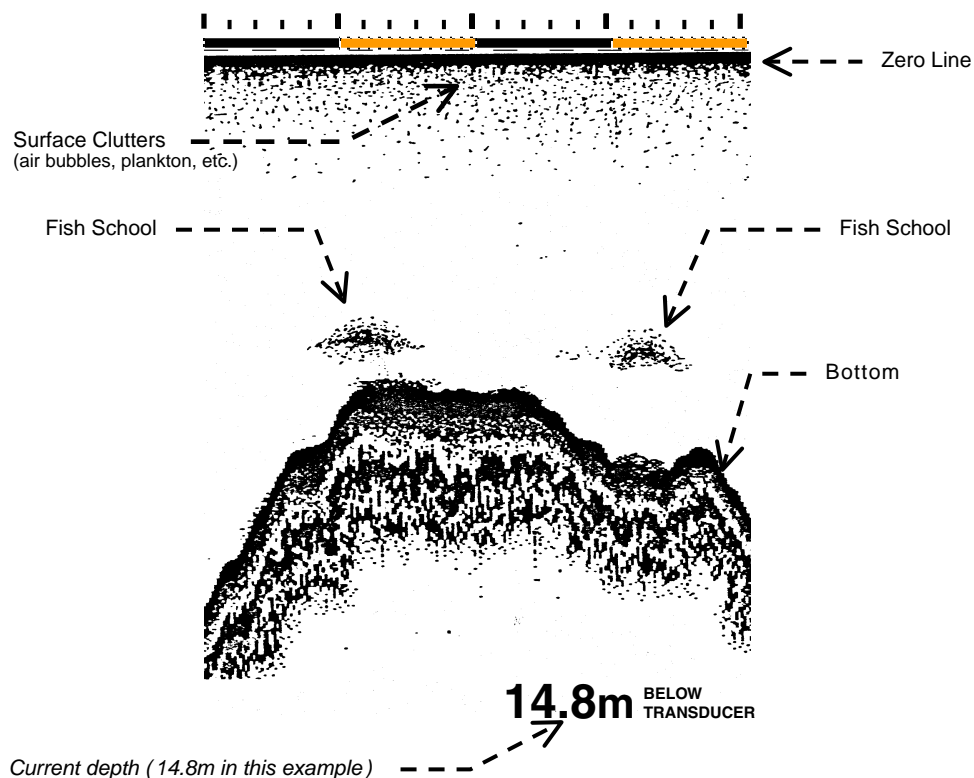
### 7.4.3. Other Echoes

- When the echo display<sup>\*1</sup> is set to show echoes in full colors, the equipment will show echoes<sup>\*2</sup> from fish schools, temperature layers, and surface clutters (various tiny objects near the surface, like plankton concentrations and air bubbles), in addition to the bottom echo.
- The figure below is an example of how such echoes show up on the screen. A thick line appearing in the strongest echo color at the upper edge of the echo display area is called a zero line, which is caused by a portion of transmitted energy leaking into the receiver, and represents the on-screen position of the transducer.
- When a transducer draft is entered (paragraph 8.2), the zero line shifts down from the top scale calibration (scale 0) by the amount of the draft.
- When a keel offset is entered (paragraph 8.10.7.3), the zero line occurs above scale 0, and its display is suppressed.

<sup>\*1</sup>: Paragraph 8.9. (**MAIN MENU** → **8:ECHO DISPLAY** → **2:NORMAL DISPLAY**)

<sup>\*2</sup>: Those echoes are mostly suppressed by TVG with the unit in the automatic control mode.

Figure 7-20 Typical Display of Shallow Water Echoes



#### < WARNINGS >



- A LARGE FISH SCHOOL, ESPECIALLY ONE AT SHALLOW DEPTHS, CAN OCCASIONALLY PRODUCE AN EXTREMELY STRONG ECHO, CAUSING THE EQUIPMENT TO LOCK ONTO THAT ECHO AS THE BOTTOM. AN INCORRECT DIGITAL READOUT WILL OCCUR AS A RESULT. BE SURE TO CONFIRM THE READOUT BY COMPARING IT WITH ON-SCREEN BOTTOM ECHO LOCATION. TOTAL RELIANCE ON THE DIGITAL DISPLAY IS DANGEROUS AND MUST BE AVOIDED, ESPECIALLY WHEN TRAVELING IN SHALLOW AREAS.**
- WHEN TRAVELING OVER A SHALLOW BOTTOM, THE EQUIPMENT MAY OCCASIONALLY LOCK ONTO THE SECOND BOTTOM ECHO, READING TWICE THE ACTUAL DEPTH. BE SURE TO COMPARE THE BOTTOM ECHO POSITION WITH THE DIGITAL DEPTH READOUT WHENEVER NAVIGATING SHALLOW WATER AREAS OR WHENEVER THE DIGITAL READOUT IS QUESTIONABLE. See paragraphs 7.4.2 and 8.6 for related information.**



## 7.5. Adjusting Receiver Gain Level Manually

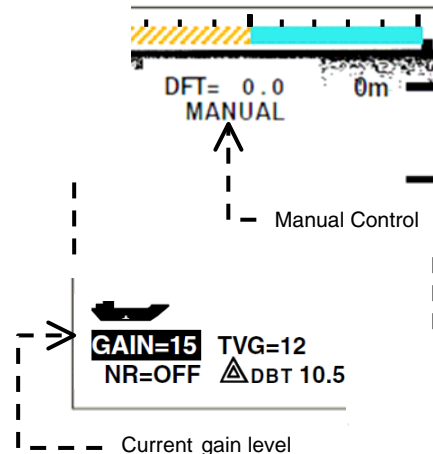
- The appropriate receiver gain level is automatically maintained while the unit is operating in the automatic control (**AUTO**) mode.
  - In situations where greater gain is required for stable depth reading operation, use the following steps:
- (1) Press **GAIN** once to activate the manual control (**MANUAL**) mode. The current gain level will be indicated as in the example below.

Figure 7-21 Parameter Indication for Manual Gain Adjustment – Example

- (2) Repeatedly press  to increase the gain until satisfactory results are obtained.
  - Too high gain may, however, result in cluttering the screen, especially near the surface, leading to unstable operation.
  - Pressing  decreases the level.
- (3) The TVG level\*1 (shallow gain suppression level) may also have to be raised to prevent surface clutters from disturbing depth reading.

\*1: See paragraph 7.6 for details.

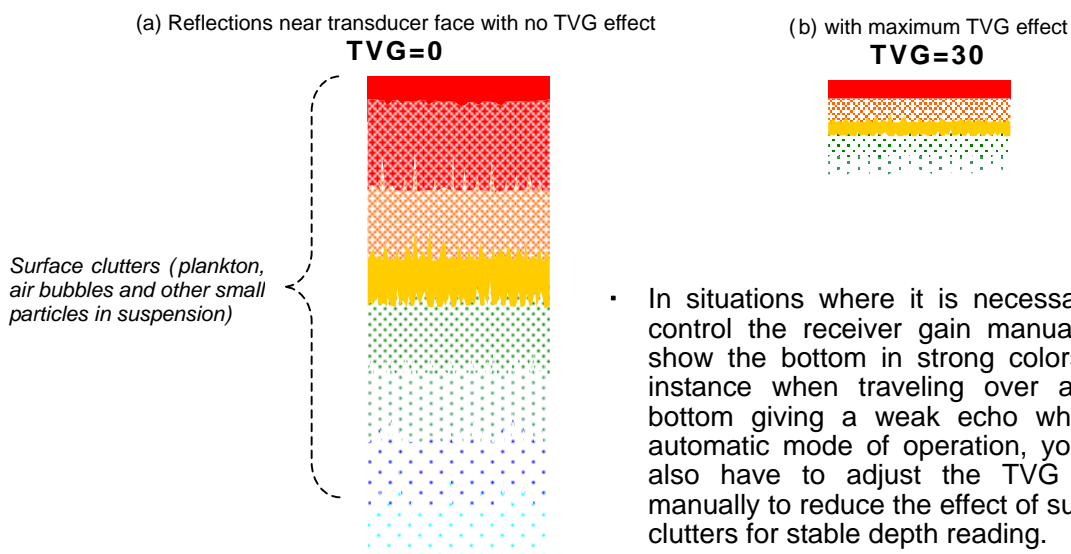
- To return to the **AUTO** mode, press **AUTO**.
- Lack of receiver gain will cause the bottom-missing alarm to be triggered.
- See paragraph 7.8.4 for information on the alarm.



## 7.6. Adjusting TVG Level Manually

- TVG stands for time-varied gain, and is designed to sharply drop the receiver gain at the start of each transmission, and then gradually recover the normal gain level as the transmitted signal travels deeper toward the bottom.
- When the equipment is operating in the automatic control (**AUTO**) mode (initial setting), TVG is also automatically adjusted.

Figure 7-22 Adjusting TVG Level – Example



- In situations where it is necessary to control the receiver gain manually to show the bottom in strong colors, for instance when traveling over a soft bottom giving a weak echo while in automatic mode of operation, you will also have to adjust the TVG level manually to reduce the effect of surface clutters for stable depth reading.

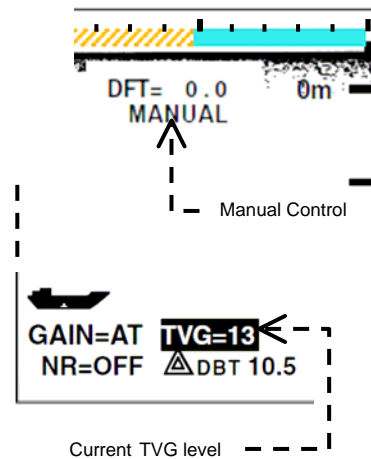
## 7.6. Adjusting TVG Level Manually (continued – 2/2)

### < CAUTION >

With the TVG set at its maximum level during shallow depth operation, extremely weak bottom echo may result, triggering the bottom-missing alarm.

Figure 7-23 Parameter Indication for Manual TVG Adjustment – Example

- (1) Press **GAIN** twice to activate the manual control (**MANUAL**) mode.
  - The TVG level indication will then be highlighted as in the example at right.
- (2) You can now select up to 31 TVG levels (**TVG=0**, minimum to **TVG=30**, maximum) by pressing **▲**/**▼**.
  - Repeatedly press **▲** to increase the TVG level until satisfactory results are obtained.
  - Too high level at shallow depths may, however, weaken the bottom echo as well, leading to unstable depth reading operation.
  - Pressing **▼** decreases the suppression level.
- (3) To return to the **AUTO** mode, press **AUTO**.



## 7.7. Retrieving Soundings Data History

### 7.7.1. Introduction

- The equipment automatically stores depth, UTC date and time, maximum depth range used, and position data\*<sup>1</sup> for a 12-hour period at intervals of two seconds.
- The following instructions enable the user to retrieve such data via an on-screen graphical user interface called the “**HISTORY**” window.

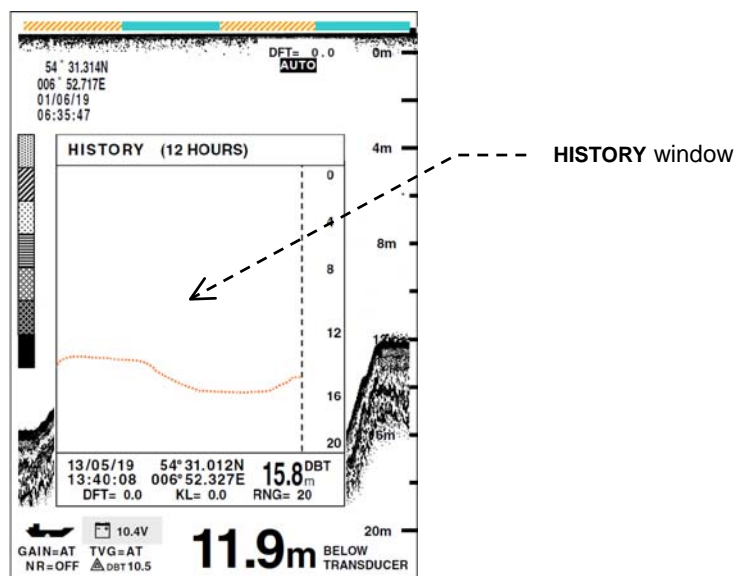
\*<sup>1</sup>: LAT/LON coordinates data will be stored when an appropriate GPS sensor is plugged into the rear-panel I/O data connector.

### 7.7.2. Displaying History Window

- To display the **HISTORY** window, simply press **HIST**. It will show up over the echogram display, as in the example below.
- A second keypress\*<sup>2</sup> turns the window off.
- The rest of the keys can be normally used to perform their assigned functions while the window is being opened.

\*<sup>2</sup>: Pressing **CLR** also closes the window.

Figure 7-24 Echo Sounder Screen with **HISTORY** Window Opened – Example

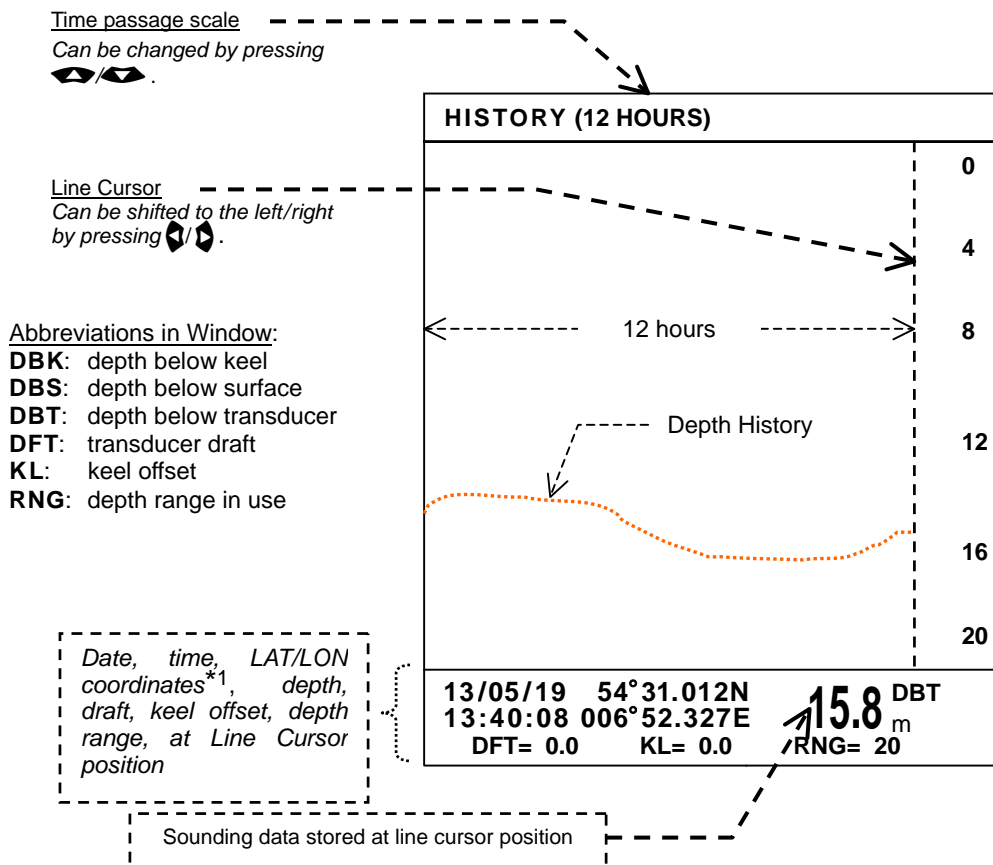


- A close-up view of a typical window is given in Figure 7-25.
- Data registered over the time scales of past 5 minutes, 15 minutes, 30 minutes, 1 hour, 2 hours, 3 hours, 6 hours and 12 hours can be retrieved.
- The history of depth soundings will be displayed graphically relative to the above time scales as well as digitally via the procedures detailed in the following paragraphs.
- Once shown in the window, the data will not be automatically updated, though the current data will be continuously stored in memory.
- To update the data in the window, close the window first by pressing **CLR** (or **HIST**) and then open it again by pressing **HIST**.

### 7.7.3. Retrieving Data Registered at Specific Date/Time

- An example soundings data history window is illustrated below where the vertical axis represents the depth scale and the horizontal axis, the time passage.
- The history of soundings over the past 12 hours is displayed graphically, while the rest of the data stored at the line cursor position are digitally shown at the bottom of the window, as in the example.
- IMPORTANT**  
If, for any reason, the equipment was switched off before current operation, all previous data saved until that moment will be displayed in blue, while the data collected during the current operation will be in white, indicating that discontinuity in time exists in the data being displayed.
- To change the time passage scale, press /.
- The current scale is shown just above the upper edge of the window, as in the example.

Figure 7-25 Soundings Data History Window – Example



\*1: Optional GPS sensor or GPS data source (IEC 61162-1/NMEA-0183) required

- The various data at the line cursor position are shown in the bottom section of the window. The line cursor can be moved by pressing /.
- The time span, 12 hours in the above example, can be changed by pressing /. The following values are selectable:  
5 minutes, 15 minutes, 30 minutes, 1 hour, 2 hours, 3 hours, 6 hours and 12 hours
- To close the window, press **HIST** again or **CLR**.

### 7.7.3. Retrieving Data Registered at Specific Date/Time *(continued – 2/2)*

- On a large time scale, such as 12 hours, the line cursor moves in large steps, such as approx. 5 minute steps on the 12-hour scale or 2 min.24 sec. steps on the 6-hour scale, making it difficult to review the soundings history over a 15-minute segment of a specific point in time.
- This shortcoming can be corrected by first shifting the line cursor close to the desired point in time, and then selecting the smallest time scale.
- You can now check the data in 2-second steps over the 15-minute segment centered on the cursor position.
- Deriving Stored Data for PC-Based Applications**  
The data stored in memory can be uploaded to PC-based applications.
  - See Section 10 (Outputting Stored Data for PC-Based Applications) for instructions.

### 7.7.4. Reviewing Detailed Soundings Data History via LOG Window

- In order to check the numeric data in detail around the line cursor position in the **HISTORY** window, another window, titled “**LOG**,” is provided and can be opened by pressing **PAGE** as in the example below.

Figure 7-26 Typical Echogram Screen with **LOG** Window Opened

- Up to a total of 17 pages of data can be accessed by pressing **▶/◀**.
- Each page lists up to nine sets of data. Pressing **◀/▶** highlights those data sets.
- When either the upper or lower edge of the window is reached, further keypress reveals the next or previous 9 sets of data.
- The time span, 12 hours in the example at right, cannot be changed through this window.
- To change the span, open the **HISTORY** window first, and then press **◀/▶**.
- To close the window, press **PAGE** again or **CLR**.
- Blue-colored data sets indicate that the data numbers are those stored until the equipment was turned off last time, and are not part of the current soundings.

Date/Time	Latitude/Longitude	Depth (DBT)
15/06/2015 13:40:08	54° 31.012N 006° 52.327E	13.1 m
15/06/2015 13:35:20	54° 31.011N 006° 52.326E	12.3 m
15/06/2015 13:30:32	54° 31.010N 006° 52.325E	11.7 m
15/06/2015 13:25:44	54° 31.009N 006° 52.324E	14.0 m
15/06/2015 13:20:56	54° 31.008N 006° 52.324E	19.2 m
15/06/2015 13:16:08	54° 31.007N 006° 52.323E	16.7 m
15/06/2015 13:11:20	54° 31.006N 006° 52.321E	19.8 m
15/06/2015 13:06:32	54° 31.005N 006° 52.320E	20.4 m
15/06/2015 13:01:54	54° 31.004N 006° 52.319E	25.6 m

## 7.8. Alarms


### 7.8.1. Introduction

- To comply with the alarm requirements\*<sup>1</sup> stipulated in the IMO Resolution for Navigational Echo Sounding Equipment, the following alarms are incorporated and enabled at all times while the equipment is switched on, except for the bottom-missing alarm:
  - Depth: Warns against decreasing depth (audible and visual indications)
  - Bottom-Missing\*<sup>2</sup>: Warns against bottom echo being lost, becoming too weak for depth measurement, or exceeding current range limit (audible and visual indications). The alarm sound will be automatically muted in 5 seconds.  
This function is available when the alarm handling protocol is optionally set\*<sup>3</sup> to the IEC 61162-1 Ed. 4 standard.
  - Power Failure: Warns against drop of primary power source voltage below factory-specified level (audible and visual indications).
  - Power Removal: Warns against removal or shutoff of primary power source (audible indication\*<sup>4</sup> only).

\*<sup>1</sup>: Paragraphs 5.3.1 and 5.3.2 of IMO resolution MSC.74(69), Annex 4.

\*<sup>2</sup>: Not a requirement in the resolution. Initially disabled. To enable it, see paragraph 8.12 for instructions.



\*<sup>3</sup>: See paragraph 7.8.2.2.1 for details.

\*<sup>4</sup>: To silence the alarm sound, press . The visual alarm will remain on-screen until the alarm condition is rectified.

### 7.8.2. Acknowledging Active Alarms

The first three alarms (depth, bottom-missing, power failure/low voltage), when they become active, can be acknowledged directly or remotely via the following procedures:

#### 7.8.2.1. Direct Acknowledgement

- Simply press  to reset the alarm status and silence the audible alarm.
- If the alarm condition continues to exist, the visual indication will remain on-screen with the sound turned off.
- The bottom-missing alarm cannot be turned off with this key; the alarm sound will be muted automatically in 5 seconds.
- When the key is pressed, pins #5 and #6 on the rear-panel **ALARM OUT** connector will be closed for 3 seconds as a signal to external alarm management applications that the active alarm is reset.
- If an external on/off (SPST) switch is plugged in to the rear-panel **ALARM ACK** connector, an active alarm can be acknowledged by turning that switch on.
- The Power Removal alarm can be reset only manually by pressing .

#### 7.8.2.2. Remote Acknowledgement by Software Commands

- This procedure applies when the echo sounder is linked to an onboard INS/BAM terminal via one of the rear-panel **RS-422-A/B** or **I/O** serial interface ports.
- Two types of communications protocol for alarm handling (IEC 61162-1 Ed. 4 and IEC 61162-1 Ed. 5) are available, and the command to acknowledge active alarms differs in format according to the protocol selected.
- Select the protocol required by your INS/BAM system via the steps given in the following paragraphs. The IEC 61162-1 Ed. 5 protocol is initially selected.

## 7.8.2. Acknowledging Active Alarms (2/3)

### 7.8.2.2. Remote Acknowledgement by Software Commands (2/3)

#### 7.8.2.2.1. Selecting Alarm Handling Protocols


- Regarding alarm handling on the bridge, two IEC standard-based protocols are selectable:
    - Protocol based on IEC 61162-1 Ed. 5 (2016), initial setting
    - Protocol based on IEC 61162-1 Ed. 4 (2010), user-selected optional setting
  - If your vessel's bridge alert management (BAM) system employs the alarm handling procedure compatible with the IEC 6162-1 Ed. 4 standard, select the matched standard through the special menu termed "**SYSTEM MENU**," as summarized below.
- (1) Turn off the equipment first, if it is already turned on.
  - (2) Display the **SYSTEM MENU** by turning the unit on while holding down **PAGE** or **MENU**.
  - (3) Select menu option "**6:BAM PROTOCOL**" by pressing  (numeric key "6").

Figure 7-27 Selecting IEC 61162-1 Ed. 4 Standard

- The following two options will be displayed:
    - **1:ALR,ACK TYPE**: Optional setting, compliant with protocol std. IEC 61162-1 Ed. 4
    - **2:ALF,ACN TYPE**: Initial setting, compliant with protocol std. IEC 61162-1 Ed. 5
  - Press **RANGE**, selecting option "**1:ALR,ACK TYPE**."
- (4) Press **ENT** to complete the selection..
  - (5) Press **PAGE** to return to the normal echogram screen.
    - For other settings to be made on the **SYSTEM MENU**, refer to Section 9 (Making Settings via SYSTEM MENU).

SYSTEM MENU	
1:BACKGROUND	
2:SYSTEM CHECK	
3:OUTPUT STORED DATA	
4:OUTPUT INTERVAL	
5:LANGUAGE	
6:BAM PROTOCOL	
7:	
6:BAM PROTOCOL	
1:ALR,ACK TYPE	
2:ALF,ACN TYPE	

#### < WARNING >

**USE OF THE WRONG PROTOCOL WILL MAKE IT IMPOSSIBLE FOR YOUR INS/BAM APPLICATIONS TO REMOTELY CONFIRM THE ALARM STATUS, ACKNOWLEDGE THE ACTIVE ALARM(S) AND/OR SILENCE THE ALARM SOUND.**

#### 7.8.2.2.2. Alarm Acknowledgement Using IEC 61162-1 Ed. 4 Format Commands

- Initially the alarm handling procedure is set to the IEC 61162-1 Ed. 5 protocol (menu option **ALF, ACN TYPE** on **BAM PROTOCOL** submenu in Figure 7-27 above).
- Select the option **ALM, ACK TYPE** first.
- To acknowledge an active alarm from your INS/BAM terminal, enter the following format (IEC 61162-1 Ed. 4/NMEA-0183) commands:
  - \$\_\_ACK , 001 , \* hh < CR > < LF > for depth alarm
  - \$\_\_ACK , 002 , \* hh < CR > < LF > for bottom-missing alarm\*1
  - \$\_\_ACK , 003 , \* hh < CR > < LF > for power failure/low voltage alarm
- Refer to paragraph 13.3.4.5 for detailed information on the alarm outputs.

\*1: Initially disabled; refer to paragraph 8.12 for details. This alarm function is not available when the BAM communications protocol is set to the IEC 61162-1 Ed. 5 standard.

## 7.8.2. Acknowledging Active Alarms (3/3)

### 7.8.2.2. Remote Acknowledgement by Software Commands (3/3)

#### 7.8.2.2.3. Alert Acknowledgement Using IEC 61162-1 Ed. 5 Format Commands

- A command format like the example below is used to acknowledge an active alert via one of the **RS-422-A/B** or **I/O** serial interface ports.

Figure 7-28 Format of Alert Acknowledgement Command – Example

\$CAACN, , JMC, 230, 1 , A , C \*08 <CR> <LF>  
           ①          ②          ③          ④          ⑤          ⑥          ⑦          ⑧

- ① Device identifier: CA (CA=BAM central alert management function, IN=INS device)
- ② Time field: null
- ③ Manufacturer mnemonic code: JMC (=Japan Marina Co. Ltd.)
- ④ Alert identifier: 230
  - 230=Depth alarm
  - 231=Power failure/low voltage alarm
- ⑤ Alert instance: null
- ⑥ Alert command: A (=acknowledge)
  - A = acknowledge
  - Q = request
  - O = transfer responsibility
  - S = silence
- ⑦ Sentence status flag\*1: C (=command)
- ⑧ Checksum: 08 hex

- Upon receiving the above formatted command, the echo sounder will stop the visual alarm, silence the audible alarm and issue the corresponding ALF output sentence\*2 for the INS/BAM applications.

\*1: Field ⑦ value "C" indicates that this sentence is a command. Without this field, the sentence is not a command.

\*2: Acknowledged alarm ALF sentence; example given in paragraph 13.3.4.5

- To silence the active audible alarm, the following format command is used:

Figure 7-29 Format of Alert Silence Command – Example

\$CAACN, , JMC, 230, 1 , S , C \*1A <CR> <LF>  
           ①          ②          ③          ④          ⑤          ⑥          ⑦          ⑧

- ⑥ Alert command: S (=silence)
  - The visual alarm remains active until the alert condition is rectified.

- When it is necessary to transfer the alert handling responsibility to other onboard applications, the following format command is used:

Figure 7-30 Format of Alert Handling Responsibility Transfer Command – Example

\$CAACN, , JMC, 230, 1 , O , C \*06 <CR> <LF>  
           ①          ②          ③          ④          ⑤          ⑥          ⑦          ⑧

- ⑥ Alert command: O (=responsibility transferred)


- Refer to paragraph 13.3.4.5 (Output Data Sentences for IEC 61162-1 Ed. 5 Alert Handling Protocol) for the corresponding alert output format.



### 7.8.3. Depth Alarm

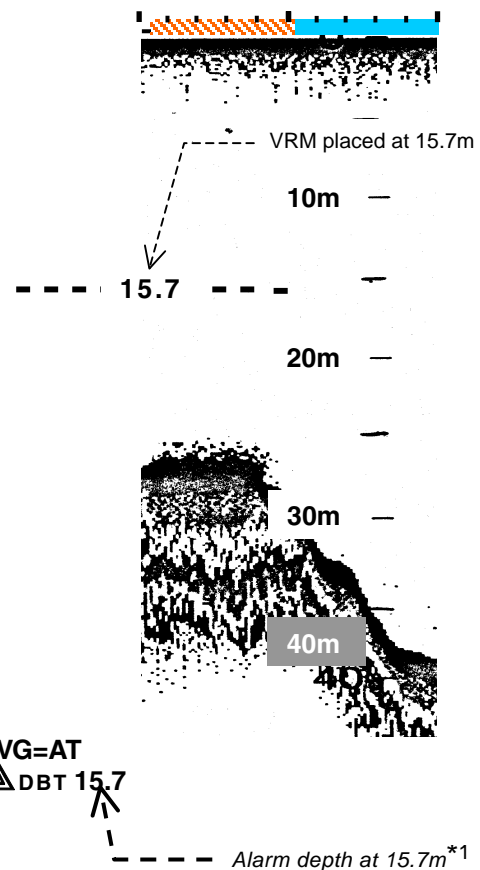
#### 7.8.3.1. Setting Alarm Depth

- To utilize this function, you have to set the alarm depth first, via the following steps:

- (1) Turn on the Variable Range Marker\*<sup>1</sup> (VRM) by pressing **ALARM**.
- (2) Repeatedly press  to place VRM at the desired alarm depth.
- (3) Press **ENT**.
  - This places the alarm depth at the VRM position.

\*<sup>1</sup>: VRM is a horizontal dotted line with depth indication to the right of its center, as in the example below. To turn it off, press **ALARM** again.

Figure 7-31 Setting Alarm Depth – Example



#### 7.8.3.2. Depth Alarm Indications

- As soon as the current depth decreases beyond the preset depth, the alarm will be triggered with the following audible and visual indications and digital output.

- Audible: Beeps at approximately 1-sec. intervals.

The sound can be muted by pressing **CLR** or by shorting the two pins on the rear-panel **ALARM ACK** connector with a user-supplied remote on/off (SPST) switch.

See paragraph 13.3.5 for details.


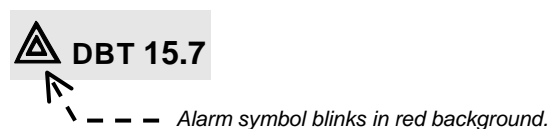
- Visual: Blinks alarm symbol  together with on-screen preset value in red background at approximately 1-second intervals.

Figure 7-32 Visual Indication of Active Depth Alarm – Example



- Digital: Outputs IEC 61162-1 Ed. 5 format \$SDALC/\$SDALF sentences\*<sup>2</sup> for alert identifier 230 or IEC 61162-1 Ed. 4 format \$SDALR sentences\*<sup>3</sup> for local alarm 001, via the rear-panel **RS-422-A/B** and **I/O** serial interface ports at approx. 30-second intervals.

See paragraph 13.3.4.5 for details.


\*<sup>2</sup>: Default alarm handling protocol

\*<sup>3</sup>: Optionally selected alarm handling protocol. See paragraph 7.8.2.2.1 (Selecting Alarm Handling Protocols) for details. The \$SDALC sentence will be output at 30-second intervals regardless of whether or not an alarm condition exists.

#### 7.8.4. Bottom-Missing Alarm

- This alarm, available when the alarm handling protocol is optionally set to the IEC 61162-1 Ed. 4 standard, will be triggered when one of the following situations occurs and continues for 4 seconds or more, making it impossible for the equipment to register depth reliably:
  - no bottom echo is received;
  - the bottom echo has become too weak, showing in weaker colors\*<sup>1</sup>; and
  - the bottom echo has exceeded the present depth range limit. (This can happen when the unit is operating in the **MANUAL** mode\*<sup>2</sup>).

\*<sup>1</sup>: yellow, green, blue, etc. or user-defined colors except two strongest ones

\*<sup>2</sup>: Pressing  switches the control to the **AUTO** mode.

- The bottom-missing alarm is initially disabled. To make the alarm available during the above operating conditions, refer to paragraph 8.12 (Enabling Bottom-Missing Alarm)\*<sup>3</sup> for instructions.

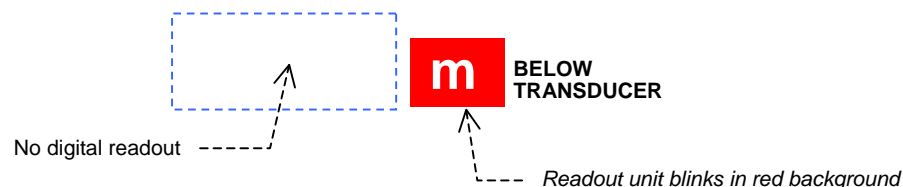
\*<sup>3</sup>: **MAIN MENU** → **9:INSTALLATION SETTINGS** → **8:BOTTOM MISSING ALM**

- The active alarm condition is indicated audibly and visually in the following manner:
  - Audible: Beeps at approximately 1-second intervals. The sound will be automatically turned off in 5 seconds.
  - Visual: Blinks depth readout unit (**m**, **FM** or **FT**) in red background at approximately 1-second intervals without a depth value.
  - Digital: Outputs IEC 61162-1/NMEA-0183 format \$SDALR sentence\*<sup>4</sup> for local alarm 002 via the rear-panel **RS-422-A/B** and **I/O** serial interface ports at approx. 30-second intervals.

See paragraph 13.3.4.5 for details.

- The function is not supported when the alarm handling protocol is set to the IEC 61162-1 Ed. 5 standard. See paragraph 7.8.2.2.1 (Selecting Alarm Handling Protocols) for details.

Figure 7-33 Visual Indication of Active Bottom-Missing Alarm



\*<sup>4</sup>: Default alarm handling protocol

- When you are operating the unit in the **MANUAL** mode,
  - increase the receiver gain or select a greater depth range, or
  - switch to the **AUTO** mode
 to remedy this condition.
- If the problem persists, especially when traveling over a precipitously changing bottom, refer to paragraph 8.13 (Selecting Depth Readout Response Times) and select a shorter readout response time\*<sup>5</sup> (**MEDIUM** or **FAST**).

\*<sup>5</sup>: **MAIN MENU** → **9:INSTALLATION SETTINGS** → **9:DEPTH READOUT RESPONSE**

- A continuing symptom indicates that the transducer in use is disconnected or has become defective.

### 7.8.5. Power Failure/Low Voltage Alarm


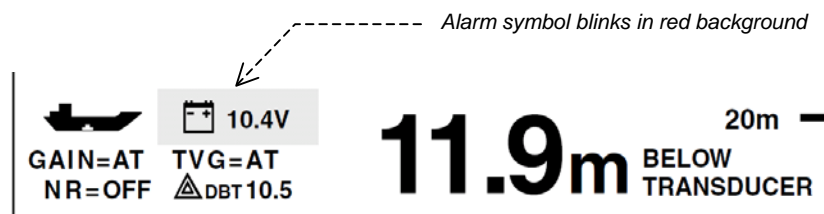
- If, for any reason, the voltage of the power source drops below the specified level (11.0V), the power failure/low voltage alarm will be triggered with the following audible and visual indications and digital output:
  - Audible: Beeps at approximately 1 second intervals.  
The sound can be muted by pressing **CLR** or by short-circuiting the two pins on the rear-panel **ALARM ACK** connector with a user-supplied remote on/off (SPST) switch.  
See paragraph 13.3.5 for details.
  - Visual: Displays both alarm symbol  and on-screen voltage readout blinking in red background at approximately 1-second intervals at the location illustrated below.  
This symbol is not displayed when no alarm condition exists.
  - Digital: Outputs IEC 61162-1 Ed. 5 format \$SDALC/\$SDALF sentences\*1 for alert identifier 231 or IEC 61162-1 Ed. 4 format \$SDALR sentence\*2 for local alarm 003, via the rear-panel **RS-422-A/B** and **I/O** serial interface ports at approx. 30-second intervals.  
See paragraph 13.3.4.5 for details.

Figure 7-34 Visual Indication of Active Power Failure/Low Voltage Alarm – Example



\*1: Default alarm handling protocol. The \$SDALC sentence will be output at 30-second intervals regardless of whether or not an alarm condition exists.

\*2: Optionally selected alarm handling protocol. See paragraph 7.8.2.2.1 (Selecting Alarm Handling Protocols) for details.

- In the event of a power outage, a power removal alarm will be triggered audibly. See paragraph 7.8.6 below for details.

### 7.8.6. Power Removal/Shutoff Alarm

- In the event that power is removed or shut off at the source (due, for instance, to accidental unplugging of power cable or to sudden power outage) with the equipment in normal operation, an audible alarm will be triggered and will continue sounding for several minutes to warn the operator of a power line trouble.
- To silence this alarm, press **CLR**. Alarm acknowledgement commands cannot be used
- Since no power is fed to the equipment under such conditions, the echogram screen is turned off and a visual alarm indication is not available.

## 8. Advanced Settings

### 8.1. Introduction

- The following settings that affect the way the equipment operates can be made via a menu system consisting of a main menu (**MAIN MENU**) and a number of associated submenus accessible through main menu options:
  - settings that you do not have to change frequently, such as the transducer draft and echo threshold level, and
  - settings that should be made mainly at initial installation time, such as depth readout unit, keel offset and local time offset.
- To activate the menu system, simply press **[MENU]**. This opens the **MAIN MENU**, as illustrated below.
- A second keypress turns it off.

Figure 8-1 **MAIN MENU**

- Menu options can be selected by pressing **[UP]**/**[DOWN]**, followed by **[ENT]**, or by appropriate numeric keys.
- The one that is currently selected is shown highlighted in a red background.

**MAIN MENU**

1:TRANSDUCER DRAFT  
 2:DEPTH REFERENCE  
**3:ECHO THRESHOLD**  
 4:NOISE REDUCTION  
 5:WHITE LINE  
 6:HISTORY SCALE  
 7:SIMULATION  
 8:ECHO DISPLAY  
 9:INSTALLATION SETTINGS

PRESS **[MENU]** TO PREVIOUS MENU  
 PRESS **[PAGE]** TO EXIT ALL

Option selected  
(highlighted in red back ground) →

### 8.2. Entering Transducer Draft

#### 8.2.1. Introduction

- The transducer draft used in this manual refers to the depth from the water surface to the transducer face, as defined in Figure 8-2.
- The depth readout shown on the screen initially represents the depth to the bottom, measured from the transducer face (depth-below-transducer or **DBT**).
- If you wish to read depths from the waterline (to agree with spot soundings or bathymetric data on official charts), you have to add the draft to the on-screen depth readout.
- The following procedure will allow you to enter the desired draft in 0.1-unit steps (0.1-meter/fathom/foot steps) so that both digital depth readout and graphical indication reflect the draft, automatically reading depth from the waterline.

#### < WARNING >

**WITH A TRANSDUCER DRAFT ENTERED, THE ON-SCREEN DIGITAL READOUT SHOWS THE DEPTH FROM THE WATERLINE AND NOT FROM THE KEEL.**

**GREAT CARE SHOULD, THEREFORE, BE TAKEN IN USING DEPTH DATA WHEN NAVIGATING SHALLOW WATER AREAS.**

*NOTE: To read depth from the keel, you must first register the keel offset (distance from the transducer face to the keel). Refer to paragraph 8.10.7.3 for details.*

## 8.2.2. Draft Entry Procedure

- (1) Press **MENU**, displaying the **MAIN MENU**.
- (2) Select "**1:TRANSDUCER DRAFT**" by pressing **RANGE** (numeric key "1") or by pressing **▲/▼** first, followed by **ENT**.
  - This turns on the **TRANSDUCER DRAFT** submenu.

Figure 8-2 Transducer Draft

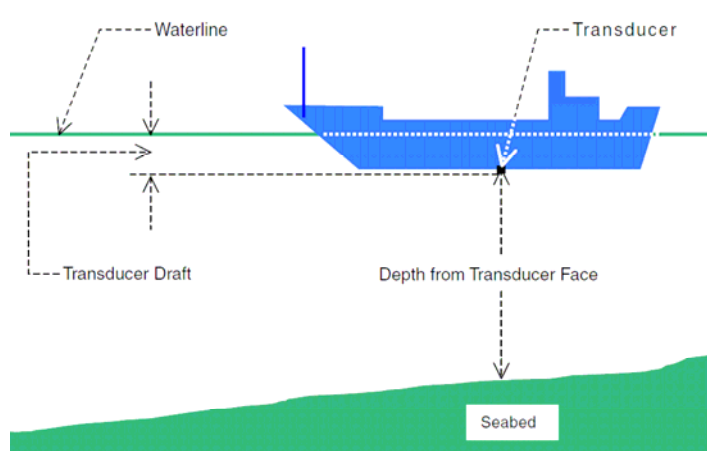


Figure 8-3 Entering Transducer Draft – Example

- (3) Enter the correct draft by repeatedly pressing **▲/▼**.
  - Numeric keys cannot be used for draft entry.
- (4) Press **ENT** to complete the entry, and then **PAGE** to exit.

*NOTE: The transducer draft can be directly entered using **DRAFT** and **▲/▼** while on the normal echogram screen. See paragraph 7.2, subparagraph ③.*

- An example below indicates how the draft entry affects the way the echogram shows up. Note that the zero line occurs at the depth of the draft.
- The digital depth readout will be the depth-below-transducer (DBT) value plus the draft.

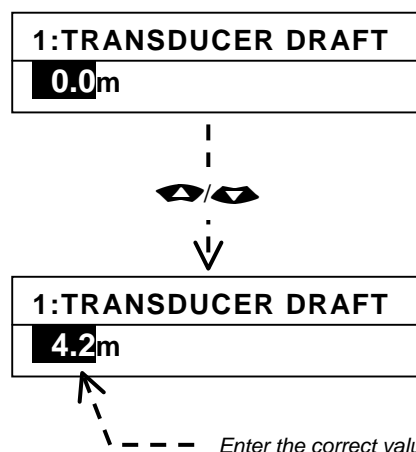
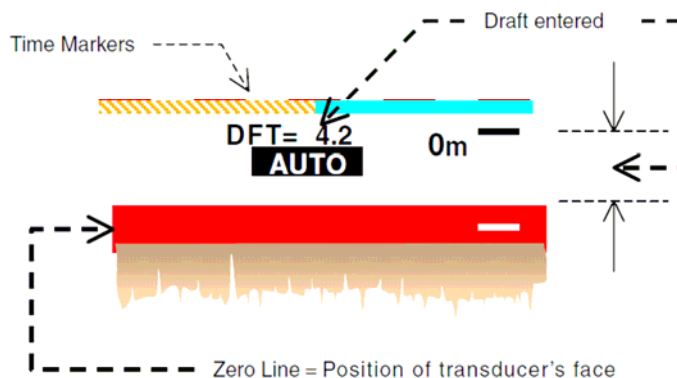


Figure 8-4 On-Screen Indication of Transducer Draft – Example

- The depth reference indication must be changed accordingly to "**BELOW SURFACE**" via the steps\*1 in paragraph 8.3.

**< WARNING >**  
WITH A TRANSDUCER DRAFT ENTERED, THE DIGITAL READOUT REPRESENTS THE DEPTH FROM THE WATERLINE AND NOT FROM THE TRANSDUCER OR FROM THE KEEL.



\* 1: **MENU** → **MAIN MENU** → **2:DEPTH REFERENCE** → **1:BELOW SURFACE** → **ENT**

## 8.3. Selecting Depth Reference Indications

### 8.3.1. Introduction

- The **CVR-010** navigation sounder is designed to indicate one of the following types of depth information at a time, depending on whether or not transducer-related settings (draft\*<sup>1</sup> and keel offset\*<sup>2</sup> entries) were made in advance:
  - Depth below Transducer face (**DBT**, initial setting)
  - Depth below Surface (**DBS**, depth below waterline, with transducer draft entered)
  - Depth below Keel (**DBK**, with keel offset entered)
- Depth data will be stored in IEC 61162-1/NMEA-0183 DPT format, i.e. DBT value with separate draft and/or keel offset regardless of whether DBS or DBK indication is chosen). See Section 10 (Outputting Stored Data for PC-Based Applications) for details.


\*1: See paragraph 8.2.

\*2: See paragraph 8.10.7.3.

### 8.3.2. Selection Procedure

- Press **MENU**, displaying the **MAIN MENU**.

Figure 8-5 Selecting Depth Reference Indications

- Select "**2:DEPTH REFERENCE**" by pressing **AUTO** or , followed by **ENT**.
  - This turns on the associated submenu, as shown at right. The options are self-explanatory.
  - Option "**2:BELOW TRANSDUCER**" is initially selected.
- Select the desired indication by pressing the appropriate numeric key.
 

<b>MAIN MENU</b>	
<b>1:TRANSDUCER DRAFT</b>	
<b>2:DEPTH REFERENCE</b>	
3:	<b>2:DEPTH REFERENCE</b>
4:	
5:	<b>1:BELOW SURFACE</b>
6:	<b>2:BELOW TRANSDUCER</b>
7:	<b>3:BELOW KEEL</b>
8:	
<b>9:INSTALLATION SETTINGS</b>	

  - BELOW SURFACE:** Indicates the current depth value being referred to the waterline. The correct transducer draft must be entered via steps in paragraph 8.2 to utilize this indication.
  - BELOW TRANSDUCER:** Indicates the current depth value being referred to the face of the transducer.
  - BELOW KEEL:** Indicates the current depth value being referred to the keel. The correct keel offset must be entered via steps in paragraph 8.10.7.3 to utilize this indication.
- Press **ENT** to complete the selection, and then **PAGE** to exit the menu system.
- Enter the appropriate transducer draft (paragraph 8.2) or keel offset (paragraph 8.10.7.3), if "**1:BELOW SURFACE**" or "**3:BELOW KEEL**" is chosen.

- Alarm Depth Indication:**

The reference of the alarm depth setting will change accordingly as you choose the desired depth reference, as in the example below:

Figure 8-6 Alarm Depth Setting Indications – Example

 <b>DBT 6.5</b>	 <b>DBS 6.5</b>	 <b>DBK 6.5</b>
Depth below transducer	Depth below surface	Depth below keel

## 8.4. Echo Threshold Adjustment

### 8.4.1. Introduction

- When the echo display\*1 is set to show echoes in full colors, echoes including the bottom reflection are shown in up to seven different colors depending on their relative strengths.
- The color scale at the left edge on the echogram screen shows the colors that are used to indicate echo strengths, with the bottom-end color (initially red) representing the strongest echo and the top-end color (initially blue), the weakest echo.
- Echo threshold adjustment consists of suppressing the display of weak color echoes, such as surface clutters, allowing only strong echoes to show up on the screen without decreasing the receiver gain. The three strongest echo colors (initially, red, orange and yellow) cannot be suppressed.

\*1: Paragraph 8.9. **MAIN MENU** → **8:ECHO DISPLAY** → **2:NORMAL DISPLAY**

### 8.4.2. Adjusting Echo Threshold Level

- Press **MENU**, displaying the **MAIN MENU**.
- Select "**3:ECHO THRESHOLD**" by pressing **DRAFT** (numeric key "3") or **▲/▼**, followed by **ENT**. This turns the associated **ECHO THRESHOLD** submenu with a threshold level entry field, and a color scale to the right, as in the example below.
  - The numeric value in the entry field represents the current suppression level, and is initially zero, allowing all echo colors to be displayed.

Figure 8-7 Adjusting Echo Threshold Level – Example

- Enter the desired echo threshold with **▲/▼** or appropriate numeric key.
  - The suppressed colors are indicated blank on the color sale, as in the example at right.
- Press **ENT** to complete the entry, and then **PAGE** to exit the menu mode.

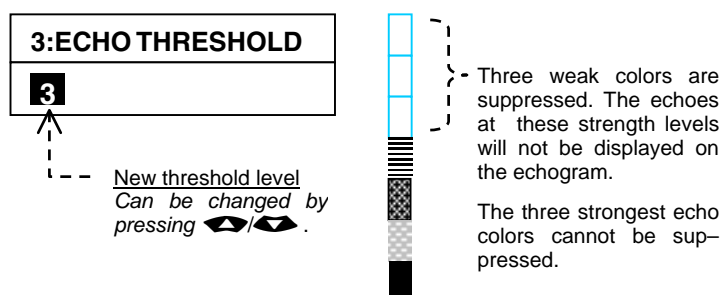
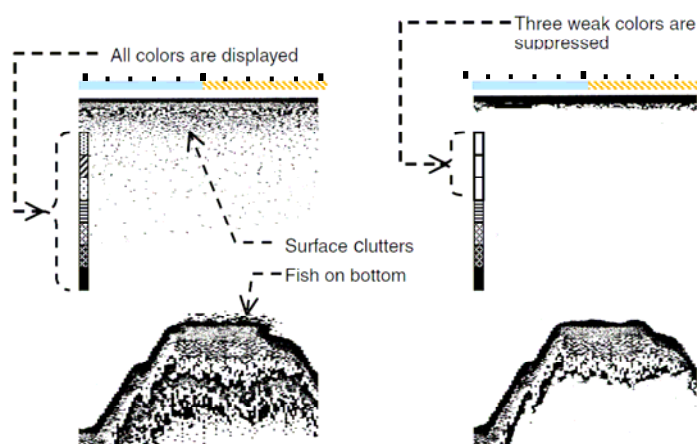


Figure 8-8 Effect of Echo Threshold on Echogram – Example

- The example at right shows how the echo threshold adjustment (with the top three weak-strength echo colors suppressed) affects the way the echogram is presented.
- The receiver gain level will remain unaffected.



*NOTE: Fish echoes can be suppressed also by setting the echo display to showing the bottom echo in a single color via the following path:*


**MAIN MENU** → **8:ECHO DISPLAY** → **1:BOTTOM CONTOUR**



## 8.5. Reducing Noise Interference

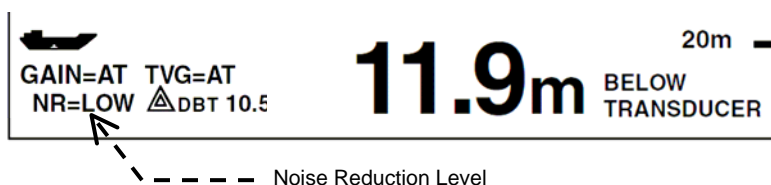
- The effect of noise interference coming from other onboard electronics or nearby echo sounders can be reduced via the menu system in the following manner:


Figure 8-9 Selecting Noise Reduction Levels

- Press **MENU**, displaying the **MAIN MENU**.
- Select "**4:NOISE REDUCTION**" by pressing **ALARM** (numeric key "4") or , followed by **ENT**.
  - This turns the **NOISE REDUCTION** submenu on, as shown at right.
  - The following levels of noise reduction (**NR**) are selectable:
    - **NR=LOW**: Selects low reduction level.
    - **NR=MID**: Selects medium reduction level.
    - **NR=HIGH**: Selects high reduction level.
    - **NR=OFF**: Terminates the function (initially selected).

MAIN MENU	
1:	TRANSDUCER DRAFT
2:	DEPTH REFERENCE
3:	ECHO THRESHOLD
4:	<b>NOISE REDUCTION</b>
5:	4:NOISE REDUCTION
6:	
7:	
8:	
9:	
	1:OFF
	2:LOW
	3:MID
	4:HIGH

Figure 8-10 Noise Reduction Level Indication – Example



- Enter the desired echo threshold with  or appropriate numeric key. The selected **NR** level is indicated as in the example above.
- Press **ENT** to complete the entry, and then **PAGE** to exit the menu mode.

## 8.6. White Line Adjustment

### 8.6.1. Introduction

- The white line adjustment<sup>\*1</sup> consists of separating the bottom echo from echoes of fish or other objects lying on or close to the bottom by suppressing the strongest colors of the bottom stratum without reducing the receiver gain on fish and other objects in suspension.
- The purpose of the function is to facilitate detection of fish echoes that look like a part of the bottom echo and, therefore, are difficult to detect on the normal echogram.

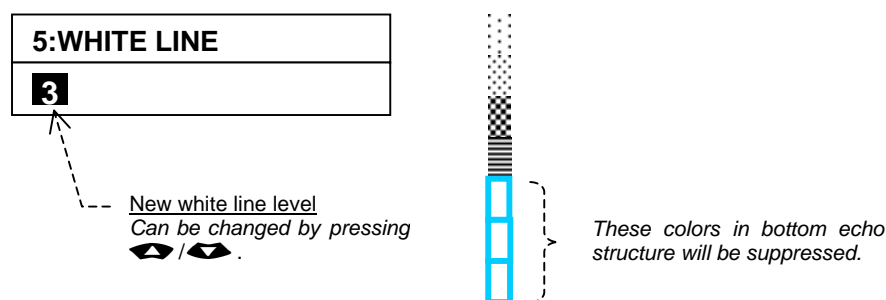
<sup>\*1</sup>: This function is available when the echo display is set to **NORMAL DISPLAY** via the procedure given in paragraph 8.9.



## 8.6.2. Adjusting White-Line Level

- (1) Press **MENU**, displaying the **MAIN MENU**.
- (2) Select "**5:WHITE LINE**" by pressing **5** (numeric key "5") or by pressing **▲/▼**, followed by **ENT**. This turns on the **WHITE LINE** submenu with a white line level entry field, and a color scale to the right.
  - The numeric value in the entry field represents the current level, and is initially zero, allowing all echo bottom colors to be displayed.

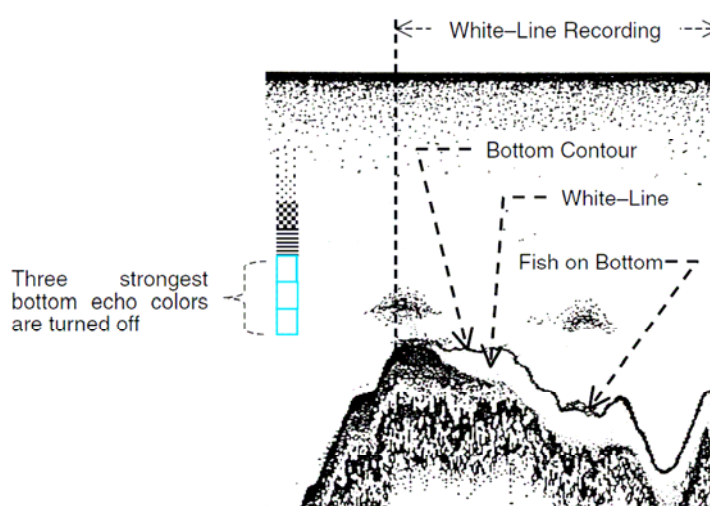
Figure 8-11 Adjusting White Line Level – Example



- (3) Pressing **▲** will change the bottom surface into a thin contour line immediately followed by a blank area.
  - As you press the key repeatedly, the colors that form the bottom stratum will be erased one by one, allowing the blank area to widen (raising the white-line level). This blank area is popularly known as the "white line" in recording type echo sounders.
  - The suppressed bottom echo colors are indicated blank on the color scale, as in the example below.
  - The two weakest colors cannot be suppressed.

Figure 8-12 Typical White-Line Echogram

- (4) Pressing **▼** restores the suppressed bottom echo colors, one at a time, thus narrowing the blank area (namely, lowering the Whiteline level).
- (5) After the desired whiteline level is reached, press **ENT** to complete the setting, and then **PAGE** to exit the menu mode.



### NOTES:

1. White Line level adjustment affects the bottom echo only, and should not be confused with echo threshold adjustment described in the preceding paragraph.
2. The last White Line level used will be stored in memory and will be recalled on subsequent power-up.

## 8.7. Selecting Time Passage Scales




Figure 8-13 Selecting Time Scales

- Selecting option “**6:HISTORY**” on the **MAIN MENU** opens the **HISTORY SCALE** submenu as shown at right, allowing you to select the time passage scales (**HISTORY** scales) for reviewing stored data via the soundings data **HISTORY** window\*<sup>1</sup>.
- The following scales are selectable as in the submenu:
  - 5 minutes, 15 minutes, 30 minutes
  - 1 hour, 2 hours, 3 hours, 6 hours and 12 hours
- The selected scale applies also when reviewing the soundings data via the **LOG** window\*<sup>2</sup>.


\*<sup>1</sup>: See paragraph 7.7 for details.

\*<sup>2</sup>: See paragraph 7.7.4 for details.

- To select the desired scale, proceed as follows:

- (1) Using /\*<sup>3</sup> or the appropriate numeric key, select the desired scale, and press .

\*<sup>3</sup>: When the **HISTORY** window is already open, pressing either of these keys selects the time passage scales directly. See paragraph 7.7 for details.

- (2) Press  to exit the menu mode.

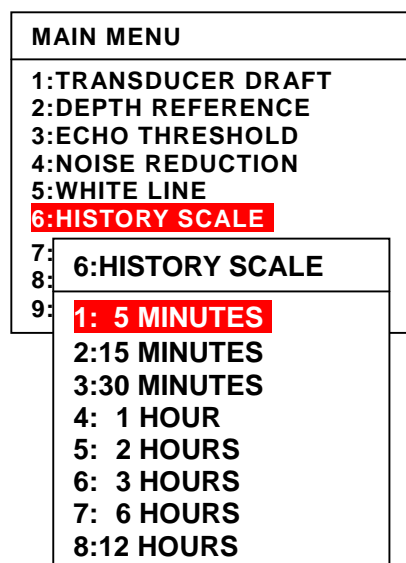
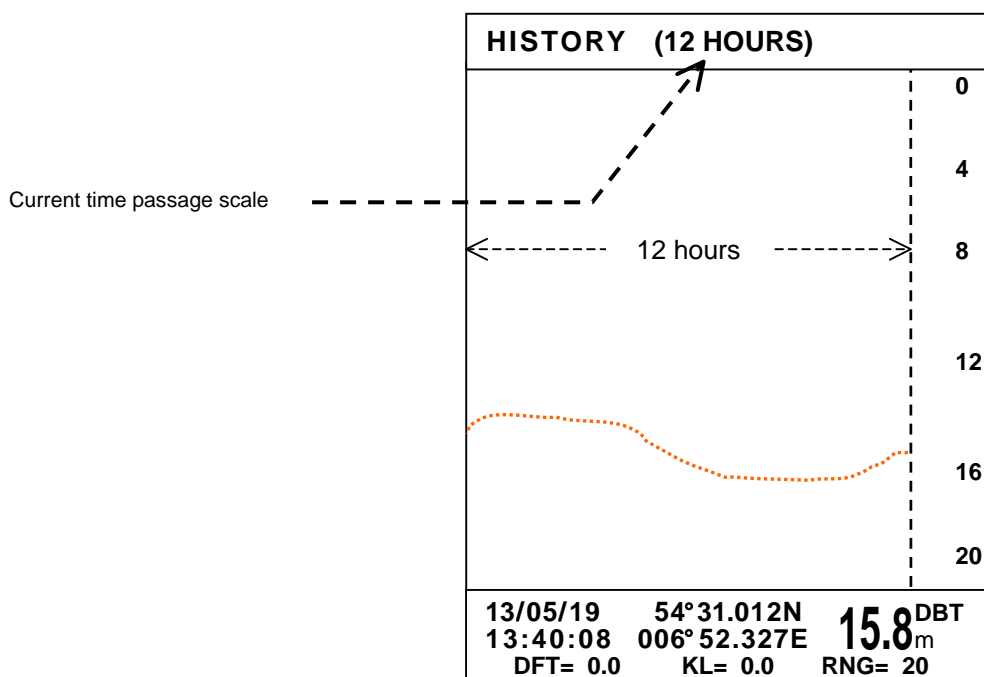


Figure 8-14 Soundings Data History Window – Example



## 8.8. Activating Echo Sounder Simulator

- An echo sounder simulator program is built in to simulate actual sounding operation, enabling you to learn how each control key or operating parameter affects the way the echogram is drawn without having to connect an underwater transducer.
- The simulator can be activated via the following menu steps:

Figure 8-15 Activating Echo Sounder Simulator

- Press **MENU**, displaying the **MAIN MENU**.
- Select **7:SIMULATION** by pressing **GAIN** (numeric key "7") or by pressing **▲/▼**, followed by **ENT**.
  - This turns on the **SIMULATION** submenu, as shown at right.
- Select **2:ON**\*1 by pressing **AUTO** (numeric key "2") or **▲/▼**, followed by **ENT**.
  - This activates the simulator, automatically selecting the 0–20 meter range\*2 (or 0–15 fathom/0–100 foot range) and starting to show an echogram.

MAIN MENU	
1:	TRANSDUCER DRAFT
2:	DEPTH REFERENCE
3:	ECHO THRESHOLD
4:	NOISE REDUCTION
5:	WHITE LINE
6:	HISTORY SCALE
7:	<b>SIMULATION</b>
8:	
9:	
7:SIMULATION	
1:	<b>OFF</b>
2:	<b>ON</b>

- To avoid the simulated echogram from being regarded as a "live" echogram with the equipment in actual service, the following caution message (**SIMULATION**) will be displayed highlighted, blinking just above the digital depth readout:

Figure 8-16 Indication of **SIMULATION** Mode – Example



\*1: This "ON" setting will not be stored in memory. Once the equipment is turned off and then on again, the simulator will be set back to "OFF."

\*2: The range can be changed by first pressing **RANGE**, followed by **▲/▼** after the normal echogram screen returns.

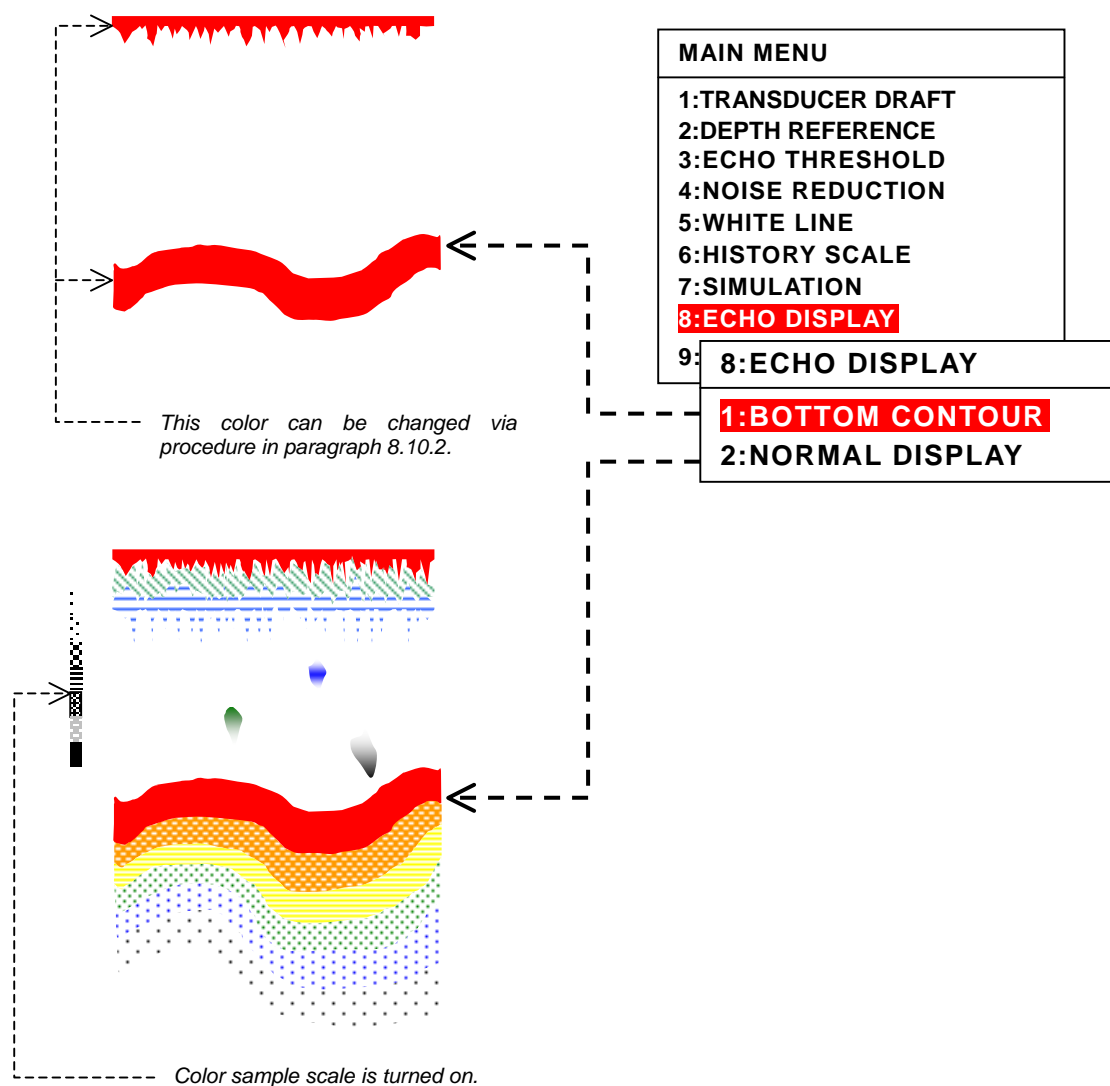
- Press **PAGE** to exit the menu mode.
  - The gain and TVG settings cannot be changed and do not affect the echogram appearance while the equipment is operating in the simulator mode.
- Bottom-Missing Alarm**
  - The bottom-missing alarm is available when the alarm handling protocol is optionally set to the IEC 61162-1 Ed. 4 standard. See paragraph 7.8.2.2 for details.
  - The alarm, which should be automatically triggered with no bottom echo or weak bottom echo received, will be turned off as soon as you set the simulator to "ON."
  - The alarm sound will be automatically muted in 5 seconds. However, if you choose a shallow range (5- or 10-meter range) that does not cover the present depth, the alarm will be triggered again.
- For more information about the alarms, see paragraph 7.8.3.

## 8.9. Selecting Types of Echo Display

- Initially the equipment shows only the strongest part of the bottom echo in a single color (initially red) with most of other echoes including fish echoes suppressed.
- If you wish to show all echoes in full colors, proceed as follows:

- Press **MENU**, displaying the **MAIN MENU**.
- Select "**8:ECHO DISPLAY**" by pressing **HIST** or by pressing /, followed by **ENT**.
  - This turns on the **ECHO DISPLAY** submenu, as shown below.

Figure 8-17 Selecting Types of Echo Display



- Press **AUTO** (numeric key "1") first, and then **ENT**.
- Press **PAGE** to exit the menu mode.

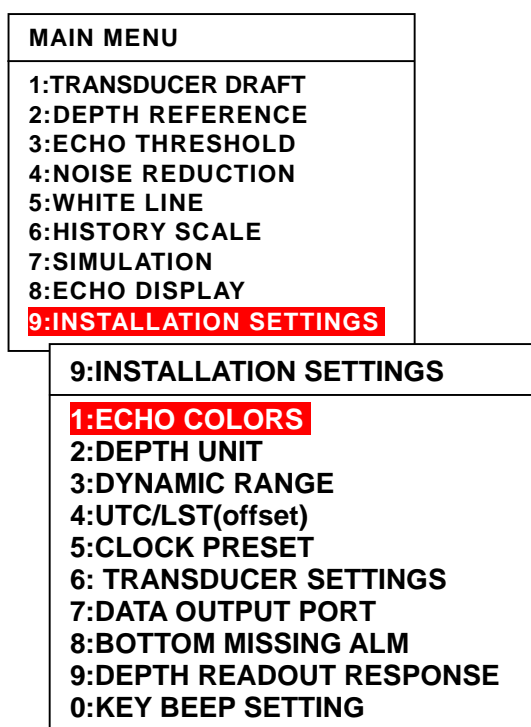
**NOTE:** The strongest echo color (strength level 7, initially red) can be changed via the instructions given in paragraph 8.10.2.


## 8.10. Installation Settings

### 8.10.1. Introduction

- The following settings that should be normally made after initial installation and does not have to be changed frequently during normal operation are placed under the **MAIN MENU** option “**9:INSTALLATION SETTINGS.**”
- Changing echo color assignments (**1:COLOR**)
- Selection of depth readout units (**2:DEPTH UNIT**)
- Selection of echo dynamic ranges (**3:DYNAMIC RANGE**)
- Entry of time offset for local time readout (**4:UTC/LST (offset)**)
- Setting built-in clock (**5:CLOCK PRESET**)
- Registration of transducer sites and keel offset (**6:TRANSDUCER SETTINGS**)
- Selection of types of data to be output (**7:DATA OUTPUT PORT**)
- Enabling/disabling bottom-missing alarm (**8:BOTTOM MISSING ALM**)
- Selection of digital depth readout response times (**9:DEPTH READOUT RESPONSE**)
- Turning on/off of keypress beep (**0:KEY BEEP SETTING**)

Figure 8-18 Accessing **INSTALLATION SETTINGS** Options



- To gain access to the **INSTALLATION SETTINGS** submenu, simply press  (numeric key “9”).
- The following instructions assume that the submenu is currently being opened.

## 8.10.2. Changing Echo Color Assignments

### 8.10.2.1. Introduction

- When the echo display\*1 is set to full color presentation, echoes will be displayed in up to seven different colors – initially, red, orange, yellow, green, yellowish green, light blue and blue in order of strength; namely, red represents the strongest level, and blue, the weakest one.
- The color scale located at the left end of the echogram screen indicates the colors that are currently used to display the echogram, with the bottom end color assigned as the strongest level.
- You can change those color assignments using a total of 10 different colors via the menu-guided steps described below.

\*1: Paragraph 8.9, **MAIN MENU** → **8:ECHO DISPLAY** → **2:NORMAL DISPLAY**

Figure 8-19 Initial Echo Colors Assignments

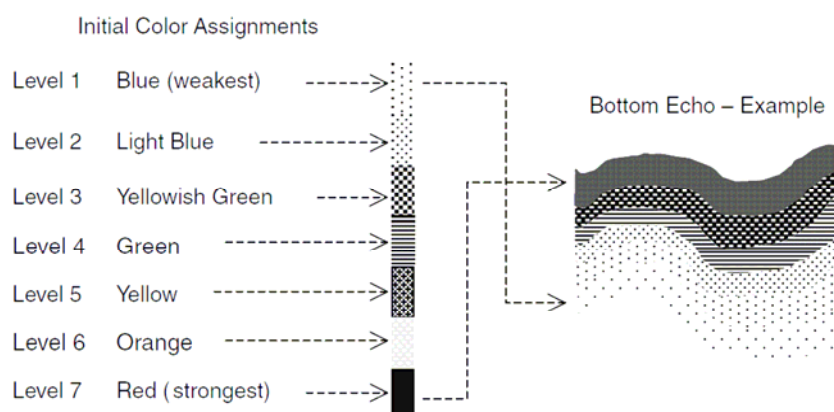
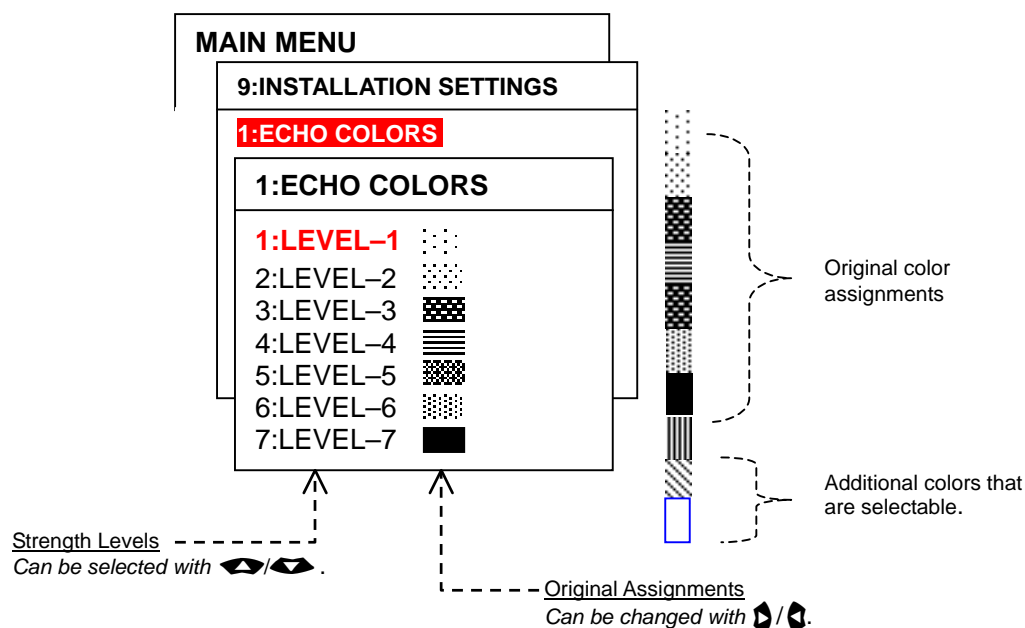






Figure 8-20 Accessing **ECHO COLORS** Submenu



## 8.10.2. Changing Echo Color Assignments *(continued – 2/2)*

### 8.10.2.2. Changing Assignments

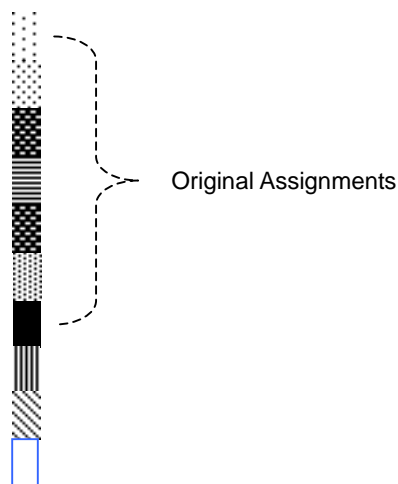
- (1) Selecting option “**1:ECHO COLORS**” opens the **ECHO COLORS** submenu with a color scale consisting of 10 color samples to the right, as in Figure 8–20.
  - The upper seven color samples on the scale represent the original assignments.
- (2) Options **LEVEL-1** through **LEVEL-7** in the submenu represent the seven echo strength levels.
  - The color sample to the right of each option is the original assignment.
  - Using /, select the level for which you wish to change the color.

*NOTE: Numeric keys cannot be used to select the options on the **ECHO COLORS** submenu.*
- (3) Repeatedly press / until the desired color shows up.
- (4) Repeat steps (2) and (3) to change the color for other strength level.
  - The **ENT** key does not have to be pressed to complete the setting.
- (5) Press **PAGE** to return to the echogram screen.

### 8.10.2.3. Returning to Original Assignments

- The upper seven color samples on the 10–color sample scale in Figure 8–21 indicate the original assignments.
- To return to the original assignments, repeat the above steps (2) through (4), selecting the colors in the same order as on the color sample scale.

Figure 8-21 Color Sample Scale



### 8.10.3. Selecting Depth Readout Units

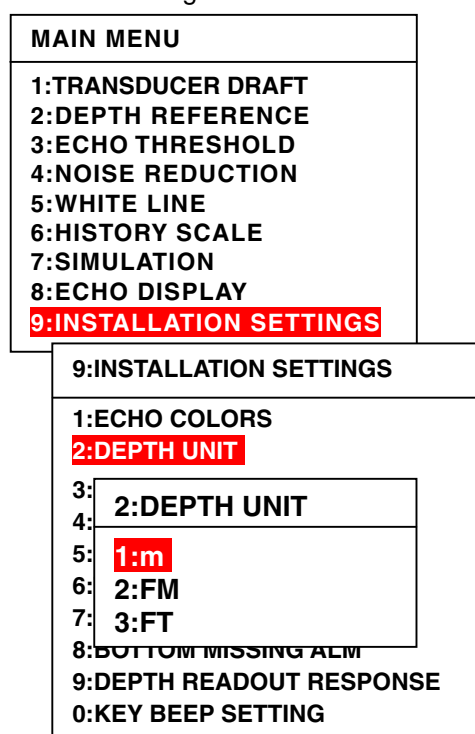
- The on-screen depth readout is initially in meters (m).
- You can read depth in fathoms (FM) or feet (FT) via the steps described below.
- However, depth information to be stored in memory for later off-line retrieval will be in meters regardless of the readout unit selected.
- See paragraph 10.1 for details.

#### < CAUTION >

In order to operate the equipment in compliance with *IMO Resolution MSC.(69)74 Annex 4*, the depth readout indication must be in meters.

Figure 8-22 Accessing DEPTH UNIT Submenu

- (1) Select "2:DEPTH UNIT" by pressing **AUTO** (numeric key "2"), opening the **DEPTH UNIT** submenu as shown at right.
  - The options available on the submenu should be self-explanatory.
- (2) Select the desired unit by pressing the appropriate numeric key.
  - For example, to read depths in fathoms, select "2:FM" by pressing **AUTO**.
- (3) Press **ENT** to complete the selection.
- (4) Press **PAGE** to exit the menu mode.





## 8.10.4. Selecting Echo Dynamic Ranges

### 8.10.4.1. Introduction

- Echoes are displayed using up to seven different colors, depending on their strengths.
  - The colors that are currently used to show echoes are indicated in the form of a color scale at the screen's left edge, with the top color (initially blue) and bottom end colors (initially red) representing the weakest echoes and strongest echoes, respectively.
  - The echo dynamic range refers to how much change in echo strength must occur before an echo can be displayed in adjacent stronger or weaker color.
  - The following selectable dynamic ranges: 3 dB, 4 dB, 5 dB and 6 dB.
  - Selecting a greater dynamic range will require a greater change in strength for an echo to be displayed in a next strong color.
- Figure 8-23 Initial Echo Dynamic Range
- 
- 3 dB: **initial setting**, suitable for working over soft grounds where the bottom echo shows in weak colors. This dynamic range will cause otherwise weak echoes to show in strong colors. Successful bottom tracking and digital depth readout requires the bottom echo to be displayed in red or orange (or user-assigned colors). A 3-dB change represents a change of approx. 1.4 times in strength.
  - 4 dB: optional setting, a compromise between 3 and 6 dB. A 4-dB change represents a change of approx. 1.6 times in strength.
  - 5 dB: optional setting, suitable for operation at mid and greater depths or over hard grounds. If you experience situations where otherwise weak echoes, such as air bubbles and plankton concentrations, show up in stronger colors at normal gain settings, try this range or 6 dB. A 5-dB change represents a change of approx. 1.8 times in strength.
  - 6 dB: optional setting. Try this if 5 dB setting still produces majority of echoes in strong colors. A 6-dB change represents a change of approx. 2 times in strength.

*NOTE: The above information does not apply when the echo display is set to show only the bottom contour in a single color (initially red). To display echoes in full colors, see instructions given in paragraph 8.9.*

- The following instructions will allow you to select the value that best suits your needs.

### 8.10.4.2. Dynamic Range Selection Procedure

Figure 8-24 **DYNAMIC RANGE** Submenu

- (1) Select "**3:DYNAMIC RANGE**" by pressing **DRAFT**, opening the **DYNAMIC RANGE** submenu.
- (2) Select the desired range by pressing the appropriate numeric key.
- (3) Press **ENT** to complete the selection, and **PAGE**.

<b>3:DYNAMIC RANGE</b>
<b>1:3dB</b>
<b>2:4dB</b>
<b>3:5dB</b>
<b>4:6dB</b>

## 8.10.5. Entering Time Offset for Local Standard Time Readout

### 8.10.5.1. Introduction

- The date and time readouts displayed at the screen's upper left corner are initially UTC (Universal Time Coordinated) date and time.
- To display the information referenced to your local standard time (LST), enter the appropriate time offset (time difference between LST and UTC) via the procedure described in the next paragraph.
- The major time offsets from UTC are listed below.

Table 8-1 Major UTC Offsets

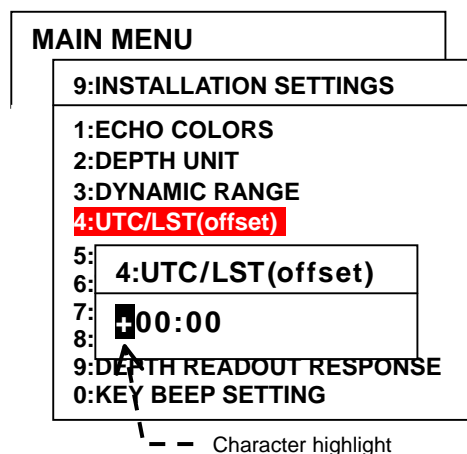
- Bangkok:	+7 hours	- Honolulu:	-10 hours* <sup>1</sup>
- Chittagong:	+6 hours	- New York:	-5 hours* <sup>1</sup>
- Djakarta:	+7 hours	- Houston:	-6 hours* <sup>1</sup>
- Dubai (Gulf Standard Time):	+5 hours	- San Francisco:	-8 hours* <sup>1</sup>
- Ho Chi Minh:	+7 hours	- Rio de Janeiro:	-3 hours
- Hong Kong:	+8 hours	- Lima:	-5 hours
- Kuala Lumpur:	+8 hours	-	
- Mumbai (Bombay):	+5.5 hours	- Barcelona:	+1 hour* <sup>1</sup>
- Perth:	+8 hours* <sup>1</sup>	- Izmir:	+2 hours* <sup>1</sup>
- Seoul:	+9 hours	- Piraeus:	+2 hours* <sup>1</sup>
- Singapore:	+8 hours	- Gdansk:	+1 hour* <sup>1</sup>
- Sydney:	+10 hours* <sup>1</sup>	- Hamburg:	+1 hour* <sup>1</sup>
- Taipei:	+8 hours	- Marseilles:	+1 hour* <sup>1</sup>
- Tokyo:	+9 hours	- Oslo:	+1 hour* <sup>1</sup>
- Vladivostok:	+10 hours	- St. Petersburg (Russia):	+3 hours* <sup>1</sup>
- Wellington:	+12 hours	- Reykjavik	0 hour

\*<sup>1</sup>: Add 1 hour for Daylight Saving Time (DST) or Central European Summer Time (CEST).

### 8.10.5.2. Time Offset Entry Procedure

- Select option "**4:UTC/LST (offset)**" by pressing numeric key **ALARM**, opening the associated **UTC/LST (offset)** submenu, ready for entering a time offset.
  - Initially an offset of +00 hours 00 minutes (+00:00) is entered as shown at right to display the UTC time.
  - The **+** sign should be initially highlighted and blinking.
  - The character highlight can be edited by pressing **▲/▼**, and can be shifted to the right/left by pressing **▶/◀**.
- Enter the desired time offset. The **+/-** sign is switched by pressing **▲/▼**.
- Press **ENT** to complete the entry.
- Press **PAGE** to exit the menu mode.
  - To return to the UTC readout, enter 00:00 at step (2).

Figure 8-25 Entering Time Offset



**NOTE:** Memory storage of data is done in UTC date/time regardless of on-screen LST readout. See paragraph 10.1 for greater details.

### 8.10.6. Setting Date and Time

- After deciding which time reference to display, UTC or LST (local standard time), via the preceding procedure (paragraph 8.10.5), set the date and time via the steps outlined below.

#### < CAUTION >

If you plan to plug in a GPS sensor, be sure to enter the correct UTC time offset before setting the date and time, or an incorrect date/time readout will result when a GPS-derived data sentence (\$GPRMC or \$GPZDA) comes in.

- Select option “**5:CLOCK PRESET**” by pressing numeric key **5**, opening the **CLOCK PRESET** submenu, ready for entering the current date and time.
  - The date must be entered in Day/Month/Year (DD/MM/YY) format.
  - The time must be entered in 24-hour (hh:mm:ss) format.

Figure 8-26 Setting Date and Time

- The highlighted and blinking character (character highlight) can be edited.
- Enter the current date using **1** / **3** and **06** / **19**.
    - Press **1** / **3** to shift the highlight to the character to be edited.
    - Press **06** / **19** to edit the highlighted character.
  - Press **ENT** to complete the entry.
  - Press **PAGE** to exit the menu mode.

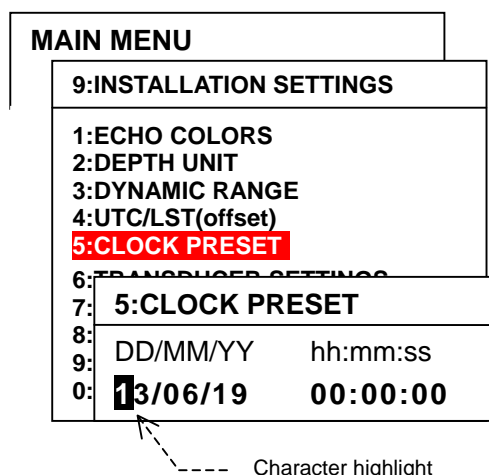
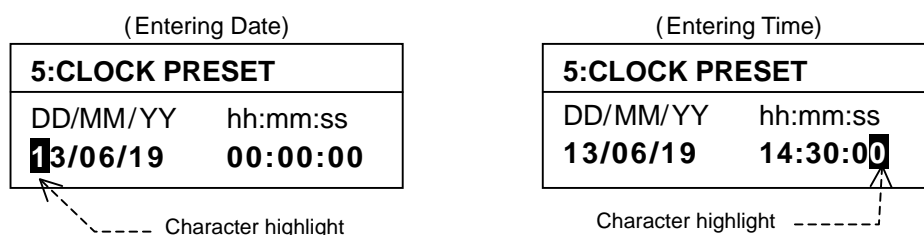


Figure 8-27 Entering Current Date and Time – Example



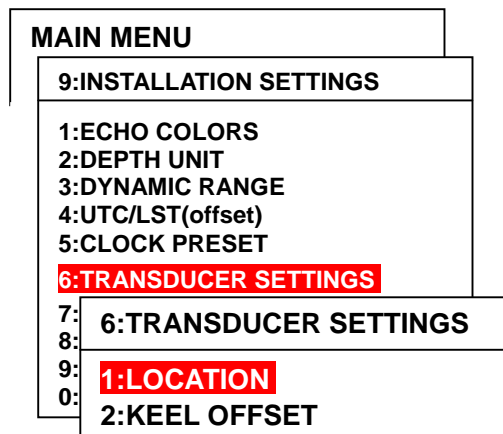
- The built-in clock is battery-backed, eliminating the need to set the date and time again after the equipment is switched off and on again.

## 8.10.7. Making Transducer-Related Settings

### 8.10.7.1. Introduction

Figure 8-28 Accessing **TRANSDUCER SETTINGS** Submenu

- In order to read depth from the keel or to graphically indicate the relative location of the transducer, you must make the following menu settings related to the transducer at initial installation time.
  - Registering transducer location
  - Entering keel offset
- These settings are grouped under option “**6:TRANSDUCER SETTINGS**” accessible through the **MAIN MENU** option “**9:INSTALLATION SETTINGS**,” as shown at right.
- The following instructions assume that the **TRANSDUCER SETTINGS** submenu is being opened.



### 8.10.7.2. Registering Relative Transducer Location


- The ship-shaped symbol (e.g. ) shown to the right of the power supply voltage readout near the lower left corner of the echogram screen indicates the relative location of the transducer.
- Three symbols are selectable to represent the installation site on-screen, as illustrated below.

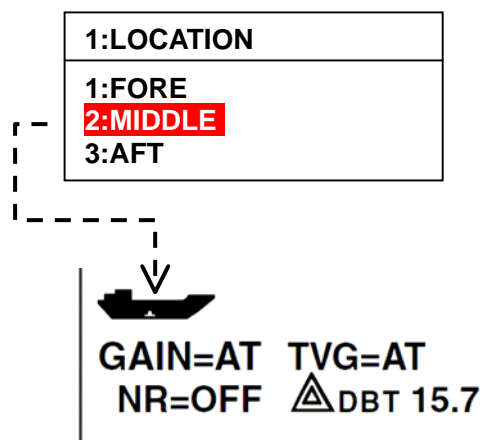
Figure 8-29 Indication of Relative Transducer Sites



- To show the appropriate location of the transducer, register the site via the following steps:

Figure 8-30 Registering Transducer Site and On-Screen Indication

- Select “**1:LOCATION**” by pressing **RANGE** (numeric key “1”), opening the **LOCATION** submenu, as shown at right.
- Select the appropriate option by pressing the corresponding numeric key.
- Press **ENT**.
- Press **PAGE** to exit the menu mode.



## 8.10.7. Making Transducer-Related Settings *(continued – 2/2)*

### 8.10.7.3. Entering Keel Offset

- To read depth from the keel, you must first register the keel offset (distance from the transducer face to the bottom end of the keel in the vertical plane, as defined in the example below).

Figure 8-31 Keel Offset – Example

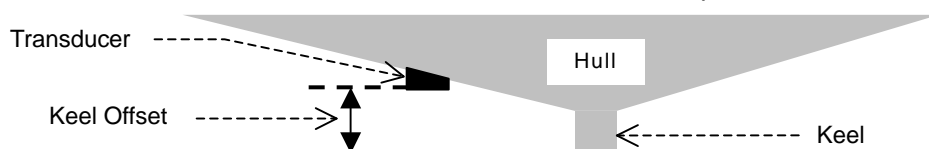
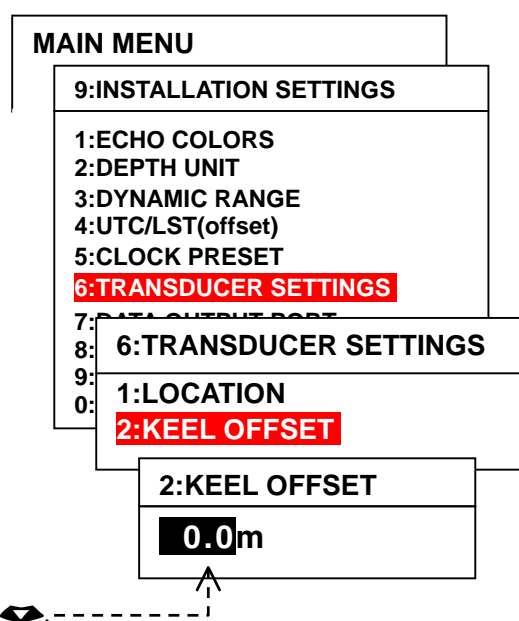


Figure 8-32 Entering Keel Offset – Example

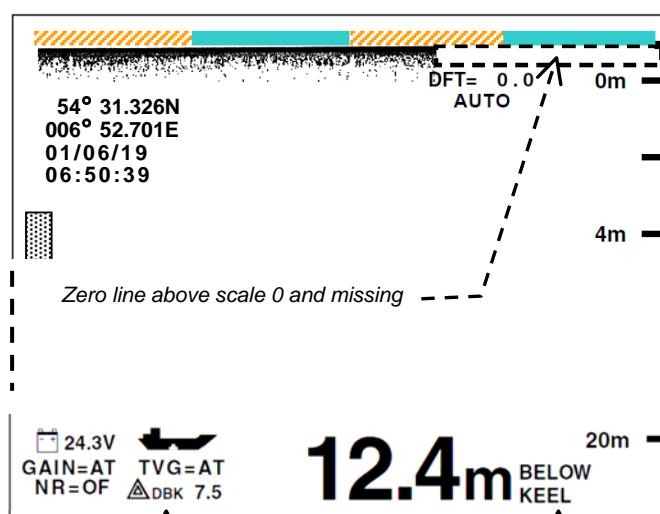
- Select **\*2:KEEL OFFSET** by pressing **AUTO** (numeric key "2"), opening the **KEEL OFFSET** submenu, as illustrated at right.
- Enter the correct offset by repeatedly pressing **▲/▼**.
- Press **ENT** to complete the entry.
- Press **PAGE** to exit the menu mode.
- Set the depth measurement reference to **"BELOW KEEL"** via the procedure described in paragraph 8.3.



Enter the correct offset by pressing **▲/▼**.

Figure 8-33 Indication of Depth Reference with Keel Offset Entered – Example

- An example at right indicates how the keel offset entry affects the status indicators in the lower part of the screen with the depth reference set to **"BELOW KEEL."**
  - Note that the zero line (i.e. start of transmission) occurs above scale line 0, but its display is suppressed.
  - The digital depth readout and alarm depth will be a depth-below-keel (DBK) value.



## 8.11. Selecting Data Outputs

Figure 8-34 Accessing **DATA OUTPUT PORT** Submenu

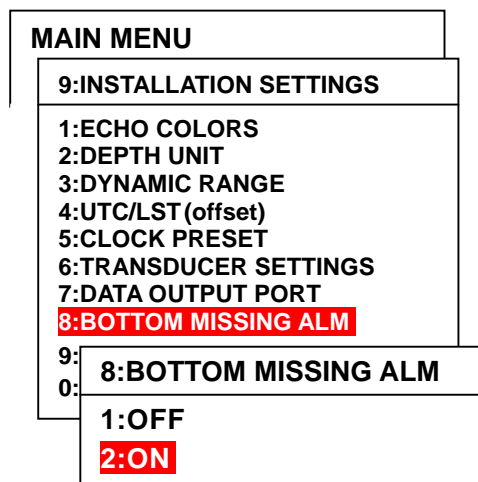
- You can select types of data, including those from a GPS receiver, to be output via the rear-panel serial interface ports (**RS-422-A/B**, I/O connectors).
  - This function should help reduce possible overloading problems that may occur if an external device connected is not capable of processing a large amount of output data or if such a device receives a data type that is not supported by the device's software.
- (1) Press **MENU** to open the **MAIN MENU**, and select "**9:INSTALLATION SETTINGS**" by pressing **DIM**.
  - (2) Select "**7:DATA OUTPUT PORT**" by pressing **GAIN**, opening the associated **DATA OUTPUT PORT** submenu, as shown at right.
    - The options on the menu represent the data types that can be output. The right-hand column shows the on/off status of each output.
- | MAIN MENU               |  |
|-------------------------|--|
| 9:INSTALLATION SETTINGS |  |
| 1:ECHO COLORS           |  |
| 2:DEPTH UNIT            |  |
| 3:DYNAMIC RANGE         |  |
| 4:UTC/LST(offset)       |  |
| 5:CLOCK PRESET          |  |
| 6:TRANSDUCER SETTINGS   |  |
| 7:DATA OUTPUT PORT      |  |
- 
- | 7:DATA OUTPUT PORT |     |
|--------------------|-----|
| 1:DEPTH (DPT)      | ON  |
| 2:DEPTH (DBT)      | OFF |
| 3:DEPTH (DBK)      | OFF |
| 4:DEPTH (PSKDPT)   | OFF |
| 5:L/L (GGA)        | OFF |
| 6:GPS (RMC)        | OFF |
| 7:OTHERS           | OFF |
- **DEPTH (DPT)**: Depth data in \$SDDPT sentence
  - **DEPTH (DBT)**: Depth-below-transducer data in \$SDDBT sentence
  - **DEPTH (DBK)**: Depth-below-keel data in \$SDDBK sentence
  - **DEPTH (PSKDPT)**: Depth data in \$PSKPDPT\*<sup>1</sup> sentence
  - **GPS (RMC)**\*<sup>2</sup>: Minimum recommended data in \$GPRMC sentence
  - **OTHERS**\*<sup>2</sup>: Any IEC 61162-1/NMEA-0183 data other than above
- \*<sup>1</sup>: This data format is for use with **SKIPPER IR 301** digital depth repeaters only.
- \*<sup>2</sup>: These data sentences are available with an optional GPS sensor or GPS data source connected.
- Initially, depth information (**DPT**) only is output, as indicated "**ON**" above. The rest of the data are initially turned off, as indicated "**OFF**."
  - To allow other types of data to be output, execute the following additional steps:
- (3) Highlight the desired data type by pressing **▲/▼**.  
NOTE: Numeric keys cannot be used to select the menu options in this case.
  - (4) Press either **◀** or **▶** so that the status changes from "**OFF**" to "**ON**."
  - (5) Press **ENT** to complete the setting.
  - (6) Press **PAGE** to exit the menu system.
- To disable a particular data type, set its status to "**OFF**" at step (4).

## 8.12. Enabling Bottom-Missing Alarm

- The bottom-missing alarm function (paragraph 7.8.4) is available when the alarm handling protocol is set to the IEC 61162-1 Ed. 4 standard (optional setting).

Figure 8-35 Enabling Bottom-Missing Alarm

- The alarm function is initially disabled so that no warning beeps will be heard and no visual alarm indication available when the equipment has failed to capture the bottom echo.
  - To enable the function, follow the steps given below.
- Press **MENU** to open the **MAIN MENU**, and then press **DIM** to select “**9:INSTALLATION SETTINGS**.”
  - Select “**8:BOTTOM MISSING ALM**” by pressing **HIST**.
    - The **BOTTOM MISSING ALM** submenu will then be opened to show the current enabled/disabled status.
    - Initially, the status should be set to “**1:OFF**,” indicating that the function is disabled.
  - Press **AUTO**, selecting “**2:ON**,” as shown above.
  - Press **ENT** to complete the setting.
  - Exit the menu system by pressing **PAGE**.
    - With the function enabled, the alarm sound will be heard for approximately 5 seconds after the alarm is triggered and will then be automatically turned off, while the visual indication will remain on-screen until the bottom echo is recovered with a reasonable strength.
    - The alarm output sentence (\$SDALR) will, however, be continually available (at 30-second intervals) via the rear-panel **RS-422-A/B** and **I/O** serial interface ports while the alarm remains active.
    - See paragraph 13.3.4.5 for details.
    - When the initial alarm handling protocol IEC 61162-1 Ed. 5) is used, the alarm output will not be available.
    - See paragraph 7.8.2.2.1 (Selecting Alarm Handling Protocols) for related information.



## 8.13. Selecting Depth Readout Response Times

### 8.13.1. Introduction

- The equipment sometimes fails to receive a solid bottom signal due to turbulence or a layer of bubbles covering the transducer or when traveling over a precipitously sloping bottom that returns the echo to directions other than the transducer.
- If the lost-bottom condition occurs only briefly, the equipment will hold\*<sup>1</sup> the last measured depth readout until the echo is recovered.
- However, if such a condition continues in excess of a certain period of time, the echo sounder will reset the last data, starting to search for the bottom by switching the depth ranges one by one, the smallest range first. During that period, no depth readout will be available. This bottom searching operation can take up to approx. 30 seconds at a time.
- If you wish to see the change in depth more quickly when navigating areas where the bottom structure varies sharply over short distances, select shorter time periods (depth readout response times) during which the equipment holds the last depth value, via the following steps:

### 8.13.2. Selection Procedure

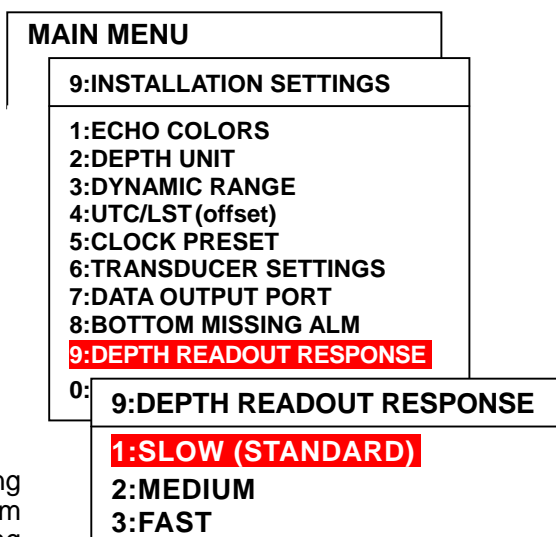
Figure 8-36 Selecting Depth Readout Response Times

- (1) Press **MENU** to open the **MAIN MENU**, and then press **DIM** to select option **"9:INSTALLATION SETTINGS."**

- (2) Highlight option **"9:DEPTH READOUT RESPONSE"** by pressing **DIM** again.

The **DEPTH READOUT RESPONSE** submenu will then be turned on, as shown at right.

- Option **"1:SLOW (STANDARD)"** should be initially selected. This setting will suffice in most operating conditions and will be suitable for general navigation.
- The equipment will hold the last sounding data for a period ranging from approximately 6 to 24 seconds depending on the range currently in use before resuming the bottom searching sequence.



- (3) If a faster response is desired, select either **"2:MEDIUM"** or **"3:FAST"** using the appropriate numeric key and **ENT**.

\*<sup>1</sup>: Approximate periods to hold the last depth measurement are as listed in the table below.

Table 8-2 Last Readout Holding Periods

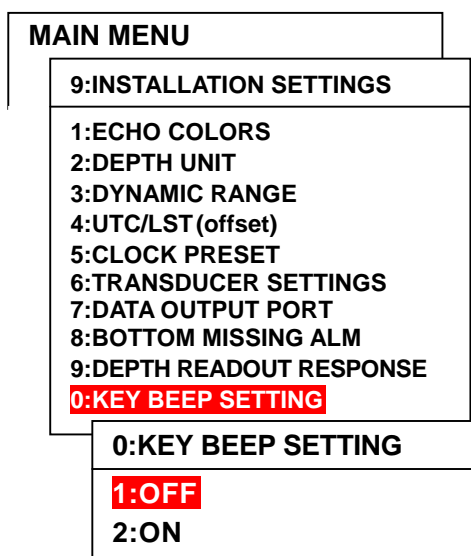
Response \ Range	40 meters	100 meters	1000 meters
<b>1:SLOW (STANDARD)</b>	6 seconds	12 seconds	24 seconds
<b>2:MEDIUM</b>	5 seconds	10 seconds	20 seconds
<b>3:FAST</b>	3.5 seconds	7 seconds	14 seconds



## 8.14. Turning off Keypress Beep

- Initially the unit responds to your keypress with a beep.
  - If you wish to turn this sound off, follow the steps below.
- (1) Press **MENU** to open the **MAIN MENU**, and then press **DIM** to select option **"9:INSTALLATION SETTINGS."**
  - (2) Highlight option **"0:KEY BEEP SETTING"** by pressing **DIM** (numeric key "0").
    - The associated submenu will then be turned on as shown at right.
  - (3) Press **RANGE** (numeric key "1") to highlight option **"1:OFF."**
  - (4) Press **ENT** to confirm the setting and then press:
    - **PAGE** to return to the echogram screen or
    - **MENU** to return to the previous menu.

Figure 8-37 Turning off Keypress Beep



## 9. Making Settings via SYSTEM MENU

### 9.1. Introduction

- The following functions are available through a devoted menu called the **SYSTEM MENU**, which is accessible by turning the equipment on while holding down **PAGE** or **MENU** :

Figure 9-1 **SYSTEM MENU**

SYSTEM MENU	
1:	BACKGROUND
2:	SYSTEM CHECK
3:	OUTPUT STORED DATA
4:	OUTPUT INTERVAL
5:	LANGUAGE
6:	BAM PROTOCOL
7:	AUTO TVG RESPONSE

- Selection of screen background colors
  - Execution of hardware integrity checks (self-diagnostic function)
  - Uploading of stored data to PC-based applications
  - Selection of data output intervals
  - Selection of menu languages
  - Selection of alarm handling protocols
  - Selection of TVG response characteristics
- A summary of the **SYSTEM MENU** options is given below.
    - 1:BACKGROUND:** Selects three background colors for echogram screen.
    - 2:SYSTEM CHECK:** Executes hardware integrity checks.
    - 3:OUTPUT STORED DATA:** Outputs stored data to PC applications via rear-panel serial interface ports (**RS-422-A/B**, **I/O** connectors). See Section 10 (Outputting Stored Data for PC-based Applications) for details.
    - 4:OUTPUT INTERVAL:** Selects intervals at which stored data is to be uploaded. See Section 10 (Outputting Stored Data for PC-based Applications) for details.
    - 5:LANGUAGE:** Selects languages to be used in menus. Current version supports English and Russian.
    - 6:BAM PROTOCOL:** Selects two alarm handling protocols for INS Bridge Alert Management (BAM) system. See paragraph 7.8.2 (Acknowledging Active Alarms) for details.
    - 7:AUTO TVG RESPONSE:** Selects optimum gain suppression characteristics for transducer installed.
  - The following instructions assume that the **SYSTEM MENU** is being opened.

### 9.2. Selecting Background Colors

Figure 9-2 Selecting Screen Background Colors

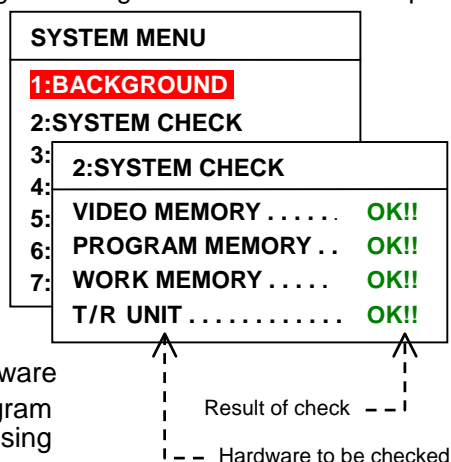
- Selecting option "**1:BACKGROUND**" opens the **BACKGROUND** submenu with three options, as illustrated at right. Those options are self-explanatory. Initially "**BLUE**" is selected, so that the echogram shows on a blue background.
- Using the appropriate numeric key, select the colors that suits the ambient lighting condition, and press **ENT** to complete the selection.
- Press **PAGE** to exit the **SYSTEM MENU** mode.

SYSTEM MENU	
1:	BACKGROUND
2:	1:BACKGROUND
3:	1:BLACK
4:	2:BLUE
5:	3:WHITE
6:	
7:	AUTO TVG RESPONSE

### 9.3. Performing Self-Diagnostic Function

Figure 9-3 Initiating Self-Diagnostic Function – Example

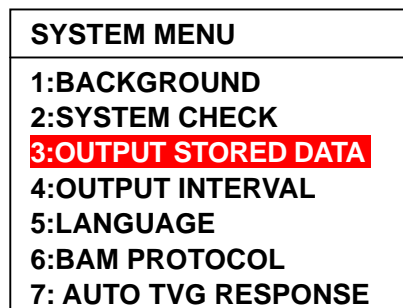
- Selecting option “**2:SYSTEM CHECK**” (by pressing **AUTO**) opens the **SYSTEM CHECK** submenu, initiating the self-diagnostic function automatically, as in the example at right.
- The following hardware components will be checked for integrity:
  - **VIDEO MEMORY**: Memory for displaying text and graphics data
  - **PROGRAM MEMORY**: Flash memory storing software
  - **WORK MEMORY**: CPU's work area for program execution and data processing
  - **T/R UNIT**: Transceiver board
- The result of each check will be indicated as follows:
  - **OK!!**: Hardware is functioning normally.
  - **ERR!!**: Hardware malfunction is detected.
- Press **PAGE** to exit the **SYSTEM MENU** mode, or any other key to return to the **SYSTEM MENU**.



### 9.4. Outputting Stored Data

Figure 9-4 Executing Stored Data Output Function

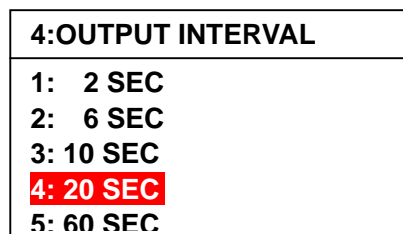
- Selecting option “**3:OUTPUT STORED DATA**” allows stored sounding data to be output via the rear-panel serial interface connectors.
- See paragraph 10.3 (Outputting Stored Data) for a detailed description of the function available by executing this option.



### 9.5. Selecting Intervals for Data Output from Memory

Figure 9-5 Selecting Stored Data Output Intervals

- Selecting option “**4:OUTPUT INTERVAL**” allows you to select the time intervals at which the stored data strings are to be output via the rear-panel serial interface connectors.
- See paragraph 10.3.2 (Selecting Intervals for Data Output from Memory) for a detailed description of the function available by executing this option.



*NOTE: Selection of a desired interval does not affect the output interval (1 sec.) of realtime depth data (DBT, DPT, DBK and PSKPDPT).*

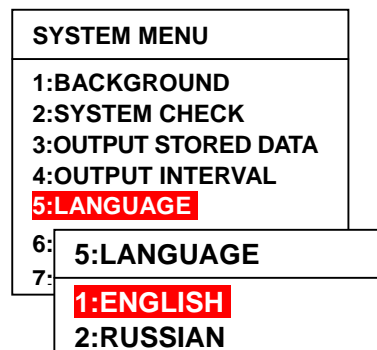
## 9.6. Selecting Menu Languages

Figure 9-6 Selecting Menu Languages – Example

- Selecting option “**5:LANGUAGE**” displays the languages that you can select to indicate various options in the menu system.
- The current software version supports English and Russian, as in the example at right. Other languages may be added in later versions.

Initially English is selected as the menu language.

- If you wish to display the menu options in Russian (or other available language), proceed via the following steps:



- (1) Select option “**5:LANGUAGE**” by pressing (numeric key “5”).
- (2) Highlight the desired option by pressing the appropriate numeric key.
- (3) Press to complete the selection. The **SYSTEM MENU** should then return.
- (4) Press to return to the normal echogram screen, unless you wish to make additional settings on the **SYSTEM MENU**.

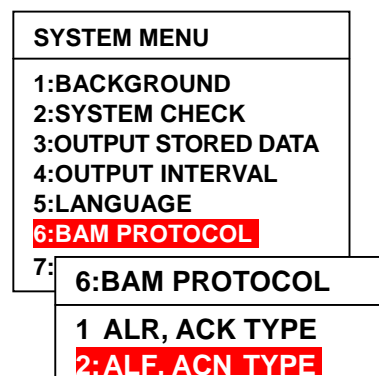
## 9.7. Selecting Alarm Handling Protocols

Figure 9-7 Selecting Alarm Handling Protocols

- Selecting option “**6:BAM PROTOCOL**” displays the associated submenu showing the following two types of alarm handling procedure.
  - **1:ALR, ACK TYPE**: Optional setting, compliant with IEC 61162–1 Ed. 4 standard
  - **2:ALF, ACN TYPE**: Initial setting, compliant with IEC 61162–1 Ed. 5 standard

- Option “**2:ALF, ACN TYPE**” is initially selected.

- Check the alarm handling protocol used in the INS BAM (bridge alert management) system of your vessel, and select the correct one via the following steps:



- (1) Select option “**6:BAM PROTOCOL**” by pressing (numeric key “6”).
- (2) Highlight the desired option by pressing the appropriate numeric key.
- (3) Press to complete the selection. The **SYSTEM MENU** should then return.
- (4) Press to return to the normal echogram screen, unless you wish to make additional settings on the **SYSTEM MENU**.

### < WARNING >

**USE OF THE WRONG PROTOCOL WILL MAKE IT IMPOSSIBLE FOR YOUR INS APPLICATIONS TO REMOTELY CONFIRM THE ALARM STATUS, ACKNOWLEDGE THE ACTIVE ALARM(S) AND/OR SILENCE THE ALARM SOUND.**

### < CAUTION >

**Resetting the system will return the protocol setting to the “ALF, ACN TYPE.” Be sure to select the “ALR, ACK TYPE” if your BAM employs the IEC 61162–1 Ed. 4 protocol.**

## 9.8. Selecting AUTO TVG Characteristics for 50 & 200 kHz Transducers

Figure 9-8 Selecting Auto TVG Characteristics – Example

- To take full advantage of the automatic TVG function, two sets of initial gain suppression curves (initial gain suppression level—versus—depth or TVG response characteristics) are incorporated and optimized for each of the approved 50 kHz and 200 kHz transducers.
- Selecting option “**7: AUTO TVG RESPONSE**” displays the list of the transducers that can be used for your echo sounder, as in the example at right.
- The following procedure assumes that a **TOKIN** 50 kHz transducer (**TGM60-50** series) is mounted in your installation.

SYSTEM MENU
1:BACKGROUND
2:SYSTEM CHECK
3:OUTPUT STORED DATA
4:OUTPUT INTERVAL
5:LANGUAGE
6:BAM PROTOCOL
7:AUTO TVG RESPONSE

7:AUTO TVG RESPONSE
1:LSE297
2:TGM-60-50

- Select option “**2:TGM-60-50**” by pressing **AUTO** (numeric key “2”).
  - Press **ENT** to complete the selection. The **SYSTEM MENU** should then return.
  - Press **PAGE** to return to the normal echogram screen, unless you wish to make additional settings on the **SYSTEM MENU**.
- In the case of 200 kHz installations, the menu options displayed will be “**1:LSE 313**” and “**2:TGM-80-200.**” If your system uses a **TOKIN** 200 kHz unit, choose “**TGM-80-200.**”

7:AUTO TVG RESPONSE
1:LSE313
2:TGM-80-200

- For installations using 100 kHz transducers, the **AUTO TVG RESPONSE** submenu will not be displayed. All approved 100 kHz units carry the same response characteristics.

## 10. Outputting Stored Data for PC-based Applications

### 10.1. Introduction

- Various types of data stored in non-volatile memory can be output via the rear-panel connectors (**RS-422-A/B** and **I/O** serial interface ports) for processing or analysis in PC-based applications.
- The soundings information retrieved from memory is in meters and in IEC 61162-1/NMEA-0183 DPT format (consisting of depth-below-transducer, draft and keel offset), regardless of whether other readout unit (**FM** or **FT**) is selected via the procedure in paragraph 8.10.3 (Selecting Depth Readout Units).
- The date/time information is in UTC even if a local time offset was entered.
- The echo sounder functions are disabled while the stored data are being uploaded to a PC or other host system, preventing the saved data from being altered or updated.

### 10.2. Data Output Format

- The data sets are output with the latest one first, and in the manufacturer's proprietary format complying with IEC 61162-1/NMEA-0183 data sentence specifications, as detailed below:

Figure 10-1 Output Format of Stored Data

\$PJMCN, X.X, X.X, X.X, 50, ddmmyy, hhmmss, (continued to next line)  
           ①      ②      ③      ④      ⑤          ⑥          ⑦  
           lll.l, a, yyyy.yyy, a \* h h <CR> <LF>  
                   ⑧      ⑨          ⑩          ⑪      ⑫      ⑬      ⑭

- ① Talker Identifier (proprietary)
- ② Depth below transducer\*1 in meters, varying in length; null if depth information was temporarily unavailable.
- ③ Offset\*1; positive (+) = transducer draft, negative (–) = offset from transducer to keel. Null if no data is entered.
- ④ Depth range used, in meters\*2
- ⑤ Transceiver frequency, in kHz; 50 = 50 kHz, 100 = 100 kHz, 200 = 200 kHz
- ⑥ Date (day/month/year) referenced to UTC; fixed in length
- ⑦ UTC time (hours/minutes/seconds), derived from internal clock or from GPS time when a valid position fix was available; fixed in length
- ⑧ Latitude coordinate (to 1/1000 minutes), varying in length; null when a valid GPS position fix was temporarily unavailable.
- ⑨ Latitude sign (N/S); null when a valid GPS position fix was temporarily unavailable.
- ⑩ Longitude coordinate (to 1/1000 minutes), varying in length; null when a valid GPS position fix was temporarily unavailable.
- ⑪ Longitude sign (E/W); null when a valid GPS position fix was temporarily unavailable.
- ⑫ Checksum
- ⑬ Carriage return
- ⑭ Line feed

\*1: If both offsets were entered, two \$PJM CN sentences will be output with the same depth-below-transducer value; one contains the transducer draft, and the other, the keel offset.

\*2: If depth measurements were done in fathoms or feet, the metric values listed in Table 13-2 (Equivalent Maximum Range Scales in Fathoms and Feet) are used to represent the maximum depth range in use.

## 10.3. Outputting Stored Data

### 10.3.1. Introduction

- The function of outputting stored data sentences can be initiated through the **SYSTEM MENU**\*1 described in Section 9 (Making Settings via SYSTEM MENU).

\*1: The menu can be opened by first turning the equipment off and then turning it on again while holding down **MENU**.

Figure 10-2 **SYSTEM MENU**

SYSTEM MENU	
1:	BACKGROUND
2:	SYSTEM CHECK
3:	OUTPUT STORED DATA
4:	OUTPUT INTERVAL
5:	LANGUAGE
6:	BAM PROTOCOL
7:	AUTO TVG RESPONSE

- The following **SYSTEM MENU** options are related to the function:
  - **3:OUTPUT STORED DATA**: Outputs stored data to PC applications via all rear-panel serial interface ports (**RS-422-A/B**, **I/O** connectors).
  - **4:OUTPUT INTERVAL**: Selects intervals at which data are to be uploaded.
- The following instructions assume that the **SYSTEM MENU** is being opened, and a suitable PC is plugged into one of the rear-panel **RS-422-A/B** or **I/O** connectors with appropriate data logging software running, such as the Windows' hyper terminal (set to text capture mode).

### 10.3.2. Selecting Output Intervals

Figure 10-3 Selecting Data Output Intervals

- The time interval at which stored data are to be output is selectable from 2, 6, 10, 20 and 60 seconds, and is initially set to 20 seconds.
- At the initial rate, it will take up to approx. 8 minutes to upload all data stored to capacity.
- If the application requires data at a shorter or longer interval, select the desired one via the following steps:
  - Select option "**4:OUTPUT INTERVAL**" by pressing **ALARM**, opening the **OUTPUT INTERVAL** menu, as at right.
  - Using the appropriate numeric key, select the time interval that best serves the current purpose.
  - Press **ENT** to complete the selection. The **OUTPUT INTERVAL** menu will then be closed.
  - Proceed to paragraph 10.3.3 (Uploading Stored Data) to activate the data uploading function.

SYSTEM MENU	
1:	BACKGROUND
2:	SYSTEM CHECK
3:	OUTPUT STORED DATA
4:	OUTPUT INTERVAL
5:	
6:	
7:	
4:OUTPUT INTERVAL	
1:	2 SEC
2:	6 SEC
3:	10 SEC
4:	20 SEC
5:	60 SEC

### 10.3. Outputting Stored Data *(continued – 2/2)*

#### 10.3.3. Uploading Stored Data

- After choosing the desired output interval via the preceding procedure, activate the data uploading function in the following manner:

Figure 10-4 Uploading Stored Data – Step (1)

SYSTEM MENU
1:BACKGROUND
2:SYSTEM CHECK
3:OUTPUT STORED DATA
4:OUTPUT INTERVAL
5:LANGUAGE
6:BAM PROTOCOL
7:AUTO TVG RESPONSE

(1) Select “3:OUTPUT STORED DATA” by pressing **DRAFT**.

- The equipment is now ready to start uploading data.
- The key symbol **[ENT]** in the “**PRESS [ENT] TO START**” message below the menu should start blinking highlighted, prompting you to press **ENT** to execute the function.

**PRESS [MENU] TO PREVIOUS MENU**  
**PRESS [ENT] TO START**

↑  
 ----- Blinking

- (2) Press **ENT** to start the data uploading process.
- A 4-to-5 digit down counter\*<sup>1</sup> should then show up in the middle between the menu and two message lines, as in the example in the figure below.
  - The counter reading becomes 0 upon completion of uploading, when the counter will be turned off.

Figure 10-5 Uploading Stored Data – Step (2)

43097

↑  
 ----- Down counter (example)

**PRESS [MENU] TO PREVIOUS MENU**  
**PRESS [CLR] TO BREAK**

(3) To terminate the uploading before it completes, press **CLR**.

(4) Press **PAGE** to exit the **SYSTEM MENU** mode, returning to the normal echo sounder screen.

\*1: The number of counter digits represents the number of output data sentence blocks terminated by carriage return (CR) and line feed (LF) codes, and its approximate maximum value varies with the output interval selected, as follows:


43,200 (2 secs),    14,400 (6 secs),    8,640 (10 secs),    4,320 (20 secs),    1,440 (60 secs)



## 11. User-Level Trouble Shooting

### 11.1. Introduction



- A list of common troubles the user may experience while operating the equipment is given below along with recommended remedies for such troubles.
- If a problem persists, contact your dealer for assistance, giving as much information as possible about the symptom, operating frequency, control and menu settings used, serial number of, and firmware version\*<sup>1</sup> installed in the equipment.

\*<sup>1</sup>: The firmware version number can be displayed by switching the equipment off first and then switching it on again while holding down .




### < WARNING >

**DANGEROUS HIGH RF VOLTAGE PULSES ARE PRESENT ON THE TRANSDUCER CONNECTOR PINS WHEN THE EQUIPMENT IS SWITCHED ON. THE USER MUST NOT TOUCH, OR CONNECT ANY TEST TOOL TO, THOSE CONNECTOR PINS.**

### 11.2. Depth Readout

Symptom	Suggested Solution
<p><b>No depth readout</b></p> <p><i>No bottom echo or very weak bottom shows, triggering the bottom-missing alarm at all times.</i></p>	<ol style="list-style-type: none"> <li>1. Check if transducer is properly plugged into rear panel <b>TRANSDUCER</b> connector.</li> <li>2. Activate automatic control (<b>AUTO</b>) mode by pressing , if unit is in manual control mode now.</li> <li>3. If <b>AUTO</b> mode still does not correct problem, check current <b>AUTO TVG</b> response characteristics via procedure given in paragraph 9.7, and select appropriate option that matches your transducer.</li> </ol>
<p><b>Intermittent depth readout</b></p> <p><i>Digital readout is intermittent regardless of the bottom display in one of the strongest colors.</i></p>	<ul style="list-style-type: none"> <li>▪ Bottom echo is often lost when ship is: <ul style="list-style-type: none"> <li>- heavily pitching or rolling;</li> <li>- traveling in the wake of another vessel;</li> <li>- going astern; or</li> <li>- traveling over steeply changing bottom over short distances.</li> </ul> </li> <li>▪ Select shorter readout response time, e.g. <b>MEDIUM</b> or <b>FAST</b> (ref. paragraph 8.13).</li> </ul>
<p><b>Impossible to measure depth shallower than 5 meters</b></p> <p><i>The zero line (thick line below the top scale line) is too thick, blocking reception of the bottom echo from shallow depths immediately below the transducer.</i></p>	<ol style="list-style-type: none"> <li>1. Activate automatic control (<b>AUTO</b>) mode by pressing , if unit is currently operating in manual control (<b>MANUAL</b>) mode.</li> <li>2. If <b>AUTO</b> mode still does not correct problem, check current <b>AUTO TVG</b> response characteristics via the instructions given in paragraph 9.8, and select appropriate option that matches your transducer.</li> </ol>





### 11.2. Depth Readout (continued – 2/2)

Symptom	Suggested Solution
<p><b>Depth readout is twice actual depth.</b></p> <p><i>The digital depth indication is twice the actual depth in shallow water soundings.</i></p>	<ul style="list-style-type: none"> <li>Symptom indicates that second bottom echo is displayed at twice true depth, with second echo being locked onto for depth measurement (ref. paragraph 7.4.2).</li> <li>If unit is operating in manual control (<b>MANUAL</b>) mode, reduce receiver gain by pressing  first, followed by  and/or increase TVG level by pressing twice, followed by .</li> <li>See paragraphs 7.5 and 7.6 for instructions.</li> </ul>

### 11.3. Automatic Range Selection

Symptom	Suggested Solution
<p><b>Erratic operation regardless of strong bottom echo</b></p> <p><i>Automatic depth range selection is erratic regardless of the bottom display in one of the strongest colors.</i></p>	<ul style="list-style-type: none"> <li>Bottom echo is often lost when ship is: <ul style="list-style-type: none"> <li>heavily pitching or rolling;</li> <li>moving in the wake of another vessel;</li> <li>going astern; or</li> <li>traveling over steeply changing bottom over short distances.</li> </ul> </li> <li>Select shorter readout response time, e.g. <b>MEDIUM</b> or <b>FAST</b> (ref. paragraph 8.13).</li> </ul>


### 11.4. Bottom Echo Appearance

Symptom	Suggested Solution
<p><b>Only thin bottom contour is visible.</b></p> <p><i>The bottom contour is shown in a dotted line, followed by a blank area.</i></p>	<ul style="list-style-type: none"> <li>Symptom indicates that whiteline has been activated (ref. paragraph 8.6).</li> <li>To see bottom echo in full colors, set white line level to 0 using / after accessing <b>WHITE LINE</b> submenu via path (<b>MAIN MENU</b>→<b>5:WHITE LINE</b>).</li> <li>See also paragraph 8.9 if you wish to see echoes in full colors, and check to be sure echo display option is set to <b>2:NORMAL DISPLAY</b>.</li> </ul>
<p><b>Only strong echo colors are visible.</b></p> <p><i>The bottom echo is shown in a few strong colors only.</i></p>	<ul style="list-style-type: none"> <li>Symptom indicates that echo display threshold is set at high level (ref. paragraph 8.4).</li> <li>To see bottom echo in full colors, set threshold level to 0 using / after accessing <b>ECHO THRESHOLD</b> submenu via path (<b>MAIN MENU</b> → <b>3:ECHO THRESHOLD</b>).</li> <li>See also paragraph 8.9, and check to be sure display option is set to <b>2:NORMAL DISPLAY</b>.</li> </ul>

#### 11.4. Bottom Echo Appearance (continued – 2/2)

<p><b>Most echoes are visible in strong colors.</b></p> <p><i>Most of the echoes remain in strong colors regardless of gain and TVG adjustments.</i></p>	<ul style="list-style-type: none"> <li>Symptom indicates that small echo dynamic range is selected. Check current setting via path (<b>MAIN MENU → 9:INSTALLATION SETTINGS → 3:DYNAMIC RANGE</b>) (ref. paragraph 8.10.4).</li> <li>Select <b>5 dB</b> or <b>6 dB</b>, if other value is currently selected.</li> </ul>
--	---

#### 11.5. Alarms

Symptom	Suggested Solution
<p><b>Unable to remotely confirm alarm status or acknowledge active alarm from INS terminal.</b></p>	<ol style="list-style-type: none"> <li>Check unit's current alarm handling protocol matches BAM protocol in your INS terminal, via instructions in paragraph 9.7.</li> <li>Initializing system returns alarm handling protocol to IEC 61162–1 ALF, ACN type.</li> </ol>
<p><b>Bottom–missing alarm is on at all times.</b></p> <p><i>The bottom–missing alarm is triggered and no depth readout is available regardless of the presence of the bottom echo.</i></p>	<p>Symptom indicates that bottom echo is displayed in weak colors.</p> <ol style="list-style-type: none"> <li>Activate automatic control (<b>AUTO</b>) mode by pressing <b>AUTO</b>, if unit is currently in manual control (<b>MANUAL</b>) mode.</li> <li>If you wish to continue <b>MANUAL</b> mode operation, increase the receiver gain by pressing <b>GAIN</b> first, followed by .</li> </ol>
<p><b>Bottom–missing alarm remains inactive at all times.</b></p> <p><i>The bottom–missing alarm does not get activated regardless of the absence of the bottom echo.</i></p>	<ul style="list-style-type: none"> <li>Bottom–missing alarm is initially disabled.</li> <li>To enable it, see paragraph 8.12 for instructions.</li> <li>Function is not available if alarm handling protocol is set to IEC 61162–1 Ed. 5 standard (default setting).</li> </ul>
<p><b>Unable to set depth alarm</b></p> <p><i>The alarm depth cannot be set at a new VRM position.</i></p>	<p>After shifting VRM to new position, press <b>ENT</b> (ref. paragraph 7.8.3).</p>

#### 11.6. Soundings Data History Window

Symptom	Suggested Solution
<p><b>Soundings data HISTORY window is not updated.</b></p> <p><i>The various data showing in the <b>HISTORY</b> window are not updated.</i></p>	<ul style="list-style-type: none"> <li><b>HISTORY</b> window is designed to show past 12 hours of data from moment <b>HIST</b> is pressed.</li> <li>Data shown in window are not updated automatically, though current data are continuously stored in memory.</li> <li>To update displayed data, turn window off by pressing <b>CLR</b> and then turn it on by pressing <b>HIST</b> (ref. paragraph 7.7).</li> </ul>

### 11.7. Settings through Menu System

Symptom	Suggested Solution
<b>Operation does not reflect settings made through menu system.</b>	Press <b>ENT</b> each time a setting is made, before closing current submenu (ref. paragraph 8.1).

### 11.8. Date/Time Indication

Symptom	Suggested Solution
<b>Last date and time readouts are not remembered on next power-up.</b>  <i>The date and time information you set through the menu system is lost after the equipment is switched off.</i>	<ul style="list-style-type: none"> <li>Symptom indicates that internal backup battery (type <b>CR2025</b>) for built-in real time clock is dead.</li> <li>Ask your dealer or authorized engineer to replace existing battery installed on internal main PCB.</li> </ul> <p style="text-align: center;"><b>&lt; WARNING &gt;</b>  <b>HIGH VOLTAGES EXIST INSIDE THE CONSOLE CABINET. THE USER MUST NOT OPEN THE CABINET.</b></p>
<b>Incorrect local date/standard time</b>  <i>Incorrect local date and time readouts result after a GPS sensor is plugged in.</i>	<p>Symptom indicates that correct UTC time offset is not entered or no time offset is entered.</p> <ol style="list-style-type: none"> <li>Check current offset via:  <b>MAIN MENU → 9:INSTALLATION SETTINGS → 4:UTC/LST (offset).</b>  (ref. paragraph 8.10.5)</li> <li>Enter correct time offset.</li> </ol> <p>Be sure to press <b>ENT</b> before exiting current submenu (ref. paragraph 8.10.6).</p>

### 11.9. GPS-Derived Data Outputs

Symptom	Suggested Solution
<b>No GPS-derived data outputs are available with a specified GPS sensor plugged into I/O data connector.</b>	<ul style="list-style-type: none"> <li>GPS data outputs (LAT/LON, speed, heading, etc.) from this equipment are initially turned off.</li> <li>See paragraph 8.11 for instructions to make them available.</li> </ul>

## 12. User-Level Maintenance Instructions

To ensure long-term trouble-free operation, the user should regularly follow the maintenance instructions described in this section.

### 12.1. Maintenance on the Equipment Cabinet

- Keep the equipment away from sea splashes, direct sunlight and other heat-generating sources, and make sure that air around the cabinet is circulating freely.
- If the equipment is not going to be used for prolonged periods of time, dismount the cabinet from the vessel and place it in dry storage. **Be sure to switch the equipment off before removing electrical connections from the rear panel.**

#### < WARNING >

**CHEMICAL SOLVENTS, SUCH AS PAINT THINNERS AND BENZENES, MUST NOT BE USED TO CLEAN THE CABINET OR SCREEN FILTER, OR PERMANENT DAMAGE TO THOSE PARTS WILL RESULT.**

- To clean the cabinet surface, a neutral-type household detergent intended for office equipment is recommended.
- Cleaning the acrylic filter on the LCD screen should be a maintenance routine to avoid using a high brightness level. To clean the screen filter, use a piece of slightly wet cloth. If stains persist, the cloth may be moistened with a neutral type detergent.

### 12.2. Maintenance on Electrical Connections

- The high humidity marine environment can cause electrical contacts in the rear panel connectors to corrode over time.
- Vibrations and shocks normally encountered on the vessel in motion can cause the electrical contacts to become loosened. Corroded or loose contacts will become responsible for erratic, intermittent operation or poor performance.
- To avoid such possible problems, conduct the following maintenance operations at least once a year:
  - Unplug all the cables from the rear panel, and check to be sure that contact surfaces, including the pins in the rear-panel mounted connectors are free from corrosion.
  - Check the connections at the power source for freedom from any sort of corrosion.
  - Correct any problem using a high quality contact-cleaning agent (contact rejuvenator).

#### < WARNING >

**SANDPAPER WILL DAMAGE THE CONTACT SURFACE AND MUST NOT BE USED.**

### 12.3. Maintenance on The Transducer

- Marine growth on the transducer face will cause the sensitivity (ability to detect weak echoes) to drop over time.
- Whenever there is an opportunity to access the installed transducer, check for any growth of barnacles or weed on the face. Carefully remove such growth using a piece of wood or sandpaper, taking care not to score the face material.

#### < CAUTION >

**Painting the transducer face will degrade the sensitivity.**

#### 12.4. Servicing the Equipment

- If the equipment shows any sign of malfunction, contact your dealer for assistance.
- High voltages are present inside the equipment cabinet.
- Do not open the cabinet in an attempt to correct the problem. ***There are no user-serviceable parts inside.***

#### 12.5. Resetting the System

- Resetting is the action of clearing all user-entered data and/or operational settings from the non-volatile (flash) memory on the internal CPU board, returning to the factory's default settings.
- However, the soundings data, date/time, and other information that were automatically stored in the memory intended for later review or retrieval will be protected against erasure.
- If you are repeatedly experiencing difficulty getting the equipment work the way you have programmed or if, for any reason, you wish to initialize all settings to the factory defaults, execute the resetting procedure described below:

- (1) Switch the equipment off.
- (2) Switch it on again while holding down **CLR** until a quick beep is heard. The following message will be very briefly displayed at the screen's upper left corner:

#### **CLEAR BACKUP MEMORY**

- The normal echogram screen will then return.
  - This completes the resetting procedure.
- (3) Register the desired set of operating parameters again, such as alarm depth, alarm handling protocol, date/time, UTC offset, transducer drafts, keel offsets, etc., through the menu system.
    - See Section 8 (Advanced Settings) for the relevant setting instructions.

#### **< WARNING >**

**IF THE INS BAM SYSTEM OF YOUR VESSEL IS BASED ON THE INS STANDARD IEC 61162-1 ED. 4, BE SURE TO SELECT "ALR, ACK TYPE" FOR THE SYSTEM MENU OPTION "6:BAM PROTOCOL" AGAIN ON COMPLETION OF THE SYSTEM RESET ACTION.**

**OTHERWISE, REMOTE CONFIRMATION AND ACKNOWLEDGEMENT OF ALARM STATUSES IS DISABLED.**

- See paragraph 9.7 (Selecting Alarm Handling Protocols) for details.

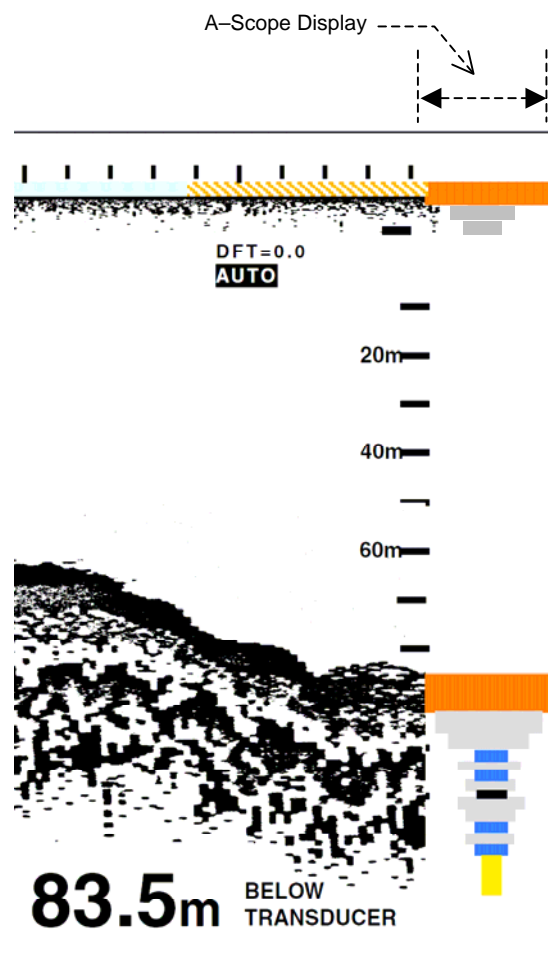
## 12.6. Temporary Display of A-Scope

- The A-scope is a format of echo presentation, showing various echo strength levels in the form of horizontal deflections, as well as in colors.
- This function is provided mainly for ease of performance checks, maintenance or alignment by authorized service engineers and can be activated via the following keystrokes:

- (1) Turn the equipment off.
- (2) Turn it on again while holding down the combination of **RANGE** and **ENT**.

Figure 12-1 Typical Echogram Screen with A-Scope Turned on

- An example display is shown at right. The size of deflection represents a relative strength level, i.e. the greater the deflection, the stronger the echo.
- The display will remain for approx. 5 minutes and will then be turned off automatically.
- The A-scope display will help estimate instantly an approximate size of an object as soon as it is detected, thereby eliminating the need to wait for the whole block of echoes to become visible across the screen while operating on deep ranges or at slow echogram feed rates.
- To turn it off quickly, shut down the unit.



## 13. Installation Instructions

### 13.1. Display Cabinet Installation

#### 13.1.1. General Precautions

- The display cabinet is constructed to withstand the humid and corrosive marine environment, but is designed to be installed or operated inside the wheelhouse or chartroom.
- Serious damage will result to the electronics inside the cabinet when it is exposed to salt water spray or splash.
- **Additional Requirements:**  
For long term trouble-free service, the proposed site for installation should be:
  - dry, well-ventilated and free as much as possible from shocks and engine vibrations.
  - away as much as possible from high temperature outlets (such as exhaust fans and heaters), and as much as possible from areas where the unit is likely to be constantly exposed to direct sunlight.

#### 13.1.2. Mounting

##### 13.1.2.1. Mounting the Cabinet

- The display cabinet is primarily designed to be mounted on a tabletop with the mounting bracket supplied and weights approximately 2.2 kg in total.
- The dimensions necessary for installation are given in Figure 13-1. Provide sufficient clearance behind the cabinet for cabling termination and maintenance checks.
- Using a total of five appropriate wood screws or bolt/nut combinations through its four mounting holes (7 mm in diameter each), secure the bracket to the selected site.
- Make sure that the mounting surface is strong enough to support the unit against shocks or vibrations that are likely to be encountered with the ship in motion.

#### **< WARNINGS >**

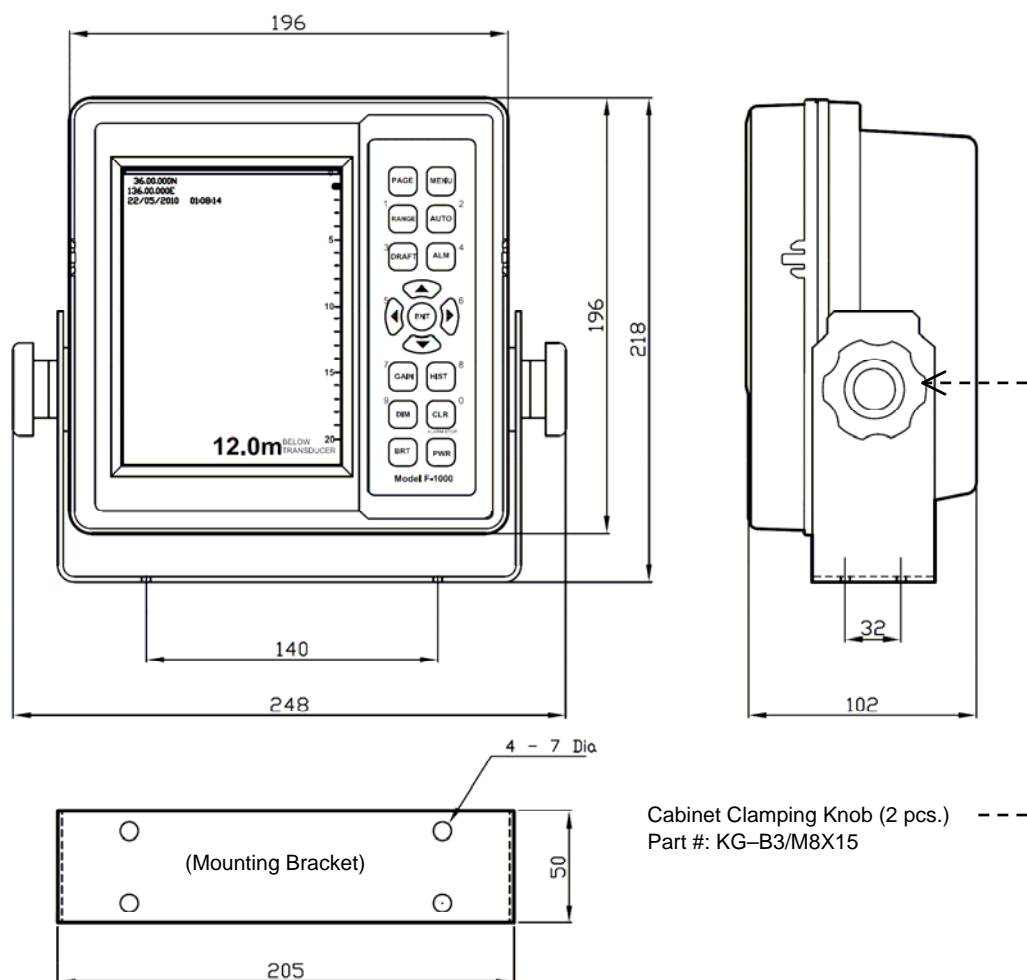
1. **EXTREMELY HIGH VOLTAGE PULSES ARE PRESENT ON THE PINS IN THE REAR-PANEL TRANSDUCER CONNECTOR WITH THE EQUIPMENT SWITCHED ON. TO PREVENT AN ACCIDENTAL CONTACT WITH ANY OF THOSE PINS WHENEVER THE TRANSDUCER IS UNPLUGGED, THE CONNECTOR MUST BE COVERED WITH THE PROTECTIVE CAP SUPPLIED. BE SURE TO LOCK THE CAP WITH THE TWO SCREWS ATTACHED.**
2. **DO NOT PLACE THE UNIT IN AN UNVENTILATED, SEALED ENCLOSURE, SUCH AS A THEFT-DETERRENT CABINET, OR OVERHEATING AND MALFUNCTION WILL RESULT.**
3. **DAMAGE CAUSED BY EXPOSURE TO WATER SPRAY OR TO DIRECT SUNLIGHT WILL NOT BE COVERED BY THE MANUFACTURER'S WARRANTY.**
  - Be sure to attach a serrated plastic washer to the inside of each arm before placing the cabinet in the bracket.
  - This pair of washers is supplied separately in the plastic bag that contains the power cable, fuses, plugs, etc., and prevents the cabinet from leaning forward or backward with the clamping knobs tightened.
  - After tilting the cabinet to a desired viewing angle, tighten the clamping knobs firmly.



### 13.1.2. Mounting (continued – 2/2)

#### 13.1.2.1. Mounting the Display Cabinet (2/2)

Figure 13-1 Installation Dimensions of Display Cabinet  
(Dimensions in millimeters)



- Weight: 1.6 kg (cabinet) + 0.55 kg (mounting bracket)
- Ambient Temperature: -15 to +55° C, 95% RH (operating, without condensation)  
-40° C (storage)
- Compass Safe Distance: 1.00m (standard compass), 0.55m (steering compass)

## 13.2. Transducer Installation

### 13.2.1. General Precautions

- The installation should be planned in advance, keeping in mind the standard cable length integrally connected to the transducer.
- In an installation where a longer cable is required, it is recommended that the transducer be ordered with the desired cable length instead of extending the existing cable with an additional cable.
- If the existing cable has to be extended, be sure to use the same type of cable supplied by the manufacturer.

#### < WARNINGS >

1. **DO NOT LIFT THE TRANSDUCER BY HOLDING ITS CABLE OR THE INTERNAL CABLE WIRING WILL BE DAMAGED DUE TO ITS WEIGHT.**
2. **THE TRANSDUCER IS A DELICATE PIECE OF ELECTRONICS, AND MUST NOT BE HIT, DROPPED OR HANDLED ROUGHLY. DAMAGE TO THE TRANSDUCER FACE CAN RESULT IN SERIOUS PERFORMANCE DEGRADATION.**

#### < CAUTION >

Use of extension cable not approved by the manufacturer will seriously degrade the transducer performance. **Coaxial cables cannot be used.**

### 13.2.2. Choosing Installation Location

- The transducer location and method of installation will greatly affect the bottom detecting capability of any echo sounding equipment.
- Careful consideration must be given to selecting the mounting location and deciding the method of installation that best suit the vessel.
- Air bubbles and turbulent streams generated by the vessel in motion will most seriously degrade the bottom tracking performance.
- The transducer should be located away from, and forward of, the propellers and shafts, well clear of any water intake/discharge line, hull openings, outlets, sea chests and any other projections along the hull that might disturb the smooth flow of water around the transducer.
- It is recommended that the transducer be located on the side where the ship's propellers will move downwards to prevent them from pushing air bubbles up against the hull.

#### < CAUTIONS >

- **Inside-the-hull mounting will cause a serious impedance mismatch between the transducer and the transceiver. The manufacturer will not guarantee depth detection performance, if such a mounting method is employed.**
- **Do not paint the transducer face, or performance degradation will result.**
- Although the appropriate location depends on the type of hull and cruising speeds, a practical choice will be somewhere between 1/3 and 1/2 of the vessel's length from the fore.
- The transducer should be installed on, or close to, the vessel's centerline. On deep-keeled vessels, care must be taken to ensure that the energy beam (shown in Table 13-1 in paragraph 13.2.5) of the transducer will not be blocked by the keel.
- If depth from the keel (DBK) is to be read, be sure to measure, and take a note of, the keel offset (distance from the transducer face to the keel in vertical plane) at this step. See paragraph 8.10.7.3 for related information.
- There should be sufficient space inside the hull to allow access to the transducer housing, cable, stuffing tube, etc.

### 13.2.3. Matched Transducers

- The equipment is designed to operate properly with one of the following BSH-approved transducers:
  - **TOKIN TGM60-50** series 50 kHz transducers (600W RMS, standard: 20m cable)
  - **TOKIN TGM80-200** series 200 kHz transducers (600W RMS, standard: 20m cable)
- The dimensions of those transducers are given in Figure 13-3 on next page.
- For installation in a steel-hulled vessel, the user (or the shipyard) must design and fabricate an appropriate housing/blister that may have to be certified by the applicable ship's classification society or a notified body to comply with the relevant requirements for wheel mark certification.

#### < WARNINGS >

1. **USE OF TRANSDUCER OTHER THAN THE ABOVE IS PROHIBITED UNDER THE RELEVANT BSH TYPE APPROVAL REGULATIONS, AND CAN RESULT IN EITHER SERIOUS DAMAGE TO THE TRANSDUCER/TRANSCEIVER OR EXTREMELY POOR DEPTH DETECTION PERFORMANCE.**
2. **DO NOT SWITCH THE EQUIPMENT ON UNTIL THE TRANSDUCER IS IMMERSSED IN WATER, OR DAMAGE TO THE TRANSDUCER CRYSTALS CAN RESULT.**

### 13.2.4. Selection of AUTO TVG Response Characteristics for Transducers

#### **IMPORTANT**

Figure 13-2 Selecting **AUTO TVG** Characteristics for 50 kHz Transducers

- To maximize the automatic TVG (**AUTO TVG**) function, two sets of optimized TVG response characteristics curves (initial gain suppression level-versus-depth response) are incorporated for each of the approved 50 kHz and 200 kHz transducers.
- Be sure to select the TVG response that matches the installed transducer via the **SYSTEM MENU**\*1. See paragraph 9.7 for instructions.
  - Select option "**2:TGM-60-50**" for the 50 kHz transducer (or "**2:TGM-80-200**" for the 200 kHz transducer) on the associated **AUTO RESPONSE** submenu\*2.

SYSTEM MENU
1:BACKGROUND
2:SYSTEM CHECK
3:OUTPUT STORED DATA
4:OUTPUT INTERVAL
5:LANGUAGE
<b>6:AUTO TVG RESPONSE</b>
<b>6:AUTO TVG RESPONSE</b> *2
1:LSE297
<b>2:TGM-60-50</b>

\*1: To display the menu, turn the unit on while holding down **PAGE**.

\*2: If the specified 200 kHz transducer is to be used, the menu options displayed will be **LSE 313** and **TGM-80-200**.

### 13.2.5. Transducer Dimensions

Figure 13-3 **TOKIN TGM** Series Transducer Dimensions

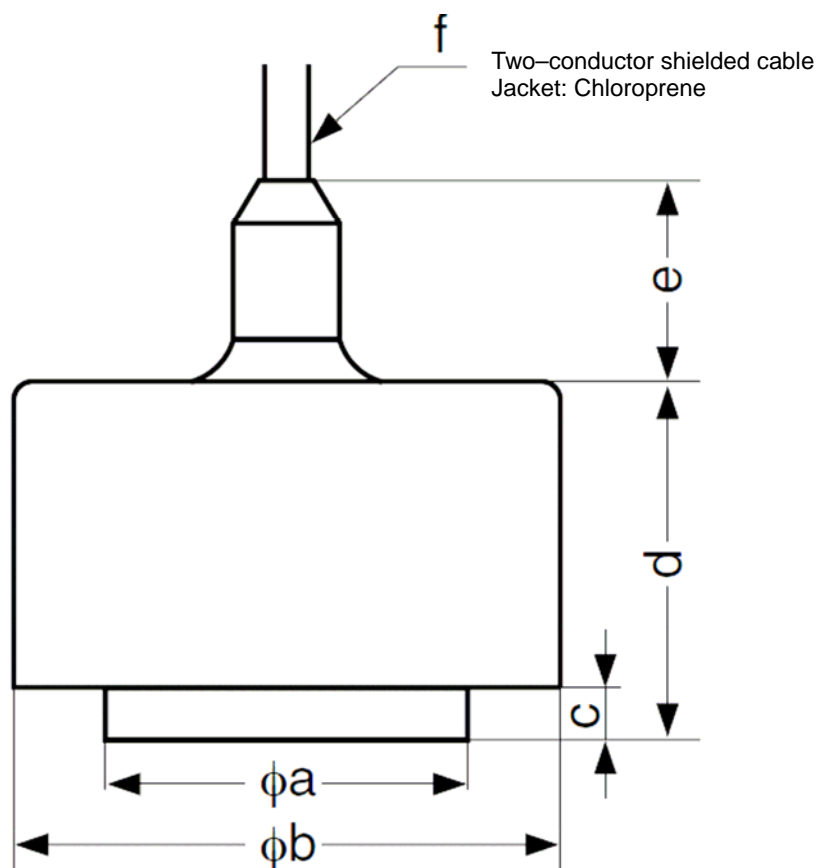


Table 13-1 Installation Dimensions of **TOKIN TGM** Series Transducers

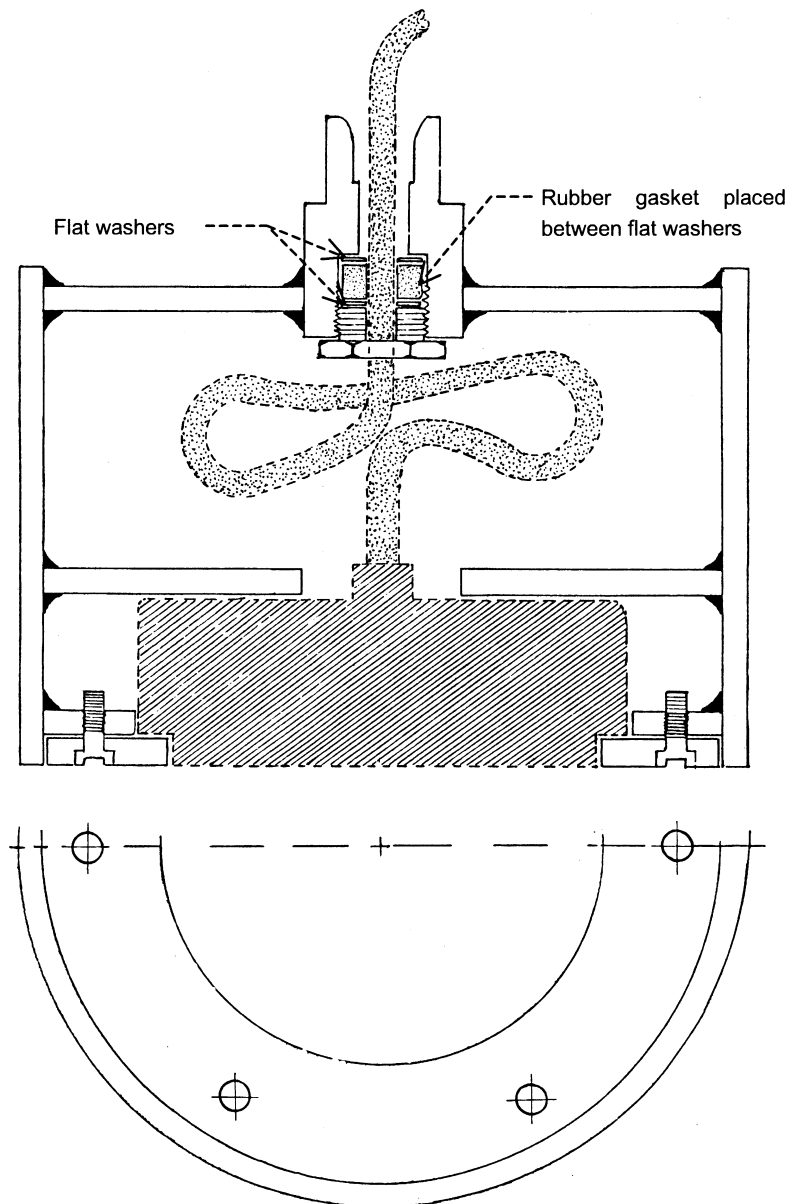
Specifications	<b>TGM60-50</b> (50 kHz)	<b>TGM80-200</b> (200 kHz)
Beam Width (@-3dB points)	33 degrees	7 degrees
Cable Length (standard)	20m	
Cable Diameter	11 mm	
<b>a</b> (diameter)	69.5 mm	100 mm
<b>b</b> (diameter)	89.5 mm	120.0 mm
<b>c</b>	5.0 mm	7.0 mm
<b>d</b>	60.0 mm	45.0 mm
<b>e</b>	60.6 mm	30.0 mm
<b>f</b> (diameter)	11 mm	11 mm

13.2.5. Transducer Dimensions (*continued – 2/2*)

Figure 13-4 Recommended Steel Housing (Blister) Structure – Example

< CAUTIONS >

1. Each housing must be approved in construction and material by the relevant ship's classification society or EU notified body before it is permitted to be installed through the hull.
2. When locally designing a matched steel housing for through-hull installation, the exact dimensions of the delivered transducer should be measured first, and then the steel housing should be fabricated on the basis of the actual measurements.

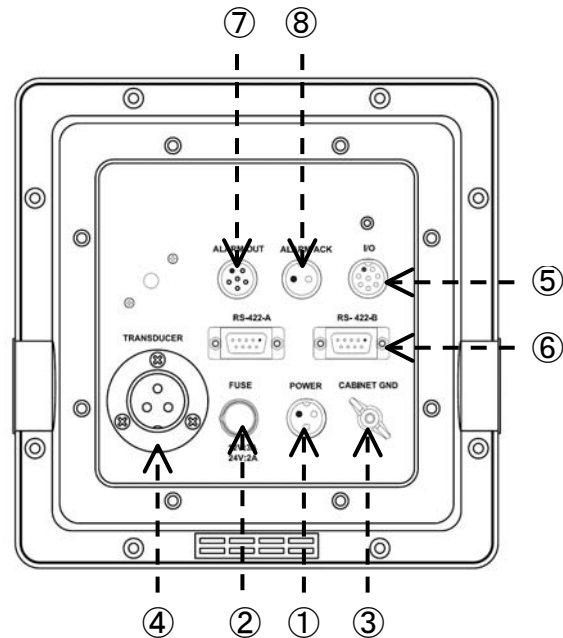


### 13.3. Electrical Connections

#### 13.3.1. Introduction

- All electrical connections to the equipment are to be made via the connector receptacles (jacks) installed on the rear panel (illustrated at right).
- Some of the cables supplied with the unit or with optional components have already been terminated in plugs, ready for immediate plugging into the cabinet.
- For the cables that require installation of plugs by soldering, appropriate mating plugs are supplied separately.
- A summary description of the pin assignments on each connector is given below. Detailed wiring instructions are described in the following pages.

Figure 13-5 Rear Panel Connectors



#### ① Power Supply Receptacle (**POWER**)

- Pin #1: DC Input (–)      ▪ Pin #2: Ground      ▪ Pin #3: DC Input (20–24V+)\*1

\*1: BSH-approved power source voltage range. The equipment safely operates over an 11–40V range.

#### ② Fuse Holder (**FUSE**)

- Fuse Ratings: 3A (12V), 2A (24V)      ▪ Fuse Size & Type: 5.2 dia.X20 mm, slow-blow

#### ③ Cabinet Ground Terminal (**CABINET GND**)

NOTE: This terminal is DC-isolated from the negative power line.

#### ④ Transducer Receptacle (**TRANSDUCER**)

- Pins #1 & #3: Transmit/Receive (to crystals)      ▪ Pin #2: Ground (to cable's shielding)

< WARNING >

**HIGH VOLTAGE RF PULSES ARE PRESENT WITH THE EQUIPMENT SWITCHED ON.**

#### ⑤ I/O Data Receptacle (**I/O**)

- Pin #1: NMEA In (+)      ▪ Pin #2: NMEA In (–)      ▪ Pin #3: NMEA Out
- Pins #4, #5, #6: Reserved      ▪ Pin #7: 12V/200 mA output      ▪ Pin #8: Ground

< WARNING >

**DO NOT MAKE ANY CONNECTIONS TO PINS #4 – #6 OTHER THAN A SPECIFIED DEVICE.**

#### ⑥ RS-422 Receptacles (**RS-422-A, RS-422-B**)

- Pins #1 – #4: Not in use      ▪ Pin #5: Ground      ▪ Pin #6: RX (+)
- Pin #7: RX (–)      ▪ Pin #8: TX (+)      ▪ Pin #9: TX (–)

#### ⑦ Alarm Output Receptacle (**ALARM OUT**)

- Pins #1 & #2: Solid-state relay output (normally open) for Power Failure/Low Voltage Alarm
- Pins #3 & #4: Mechanical relay output (normally closed) for Depth Alarm
- Pins #5 & #6: Alarm acknowledgement output (shorting of these pins)

#### ⑧ Alarm Acknowledgement Receptacle (**ALARM ACK**)

- Pins #1 & #2: To external on/off (SPST) switch to acknowledge and reset active alarm.

### 13.3.2. Power Supply Connections

#### 13.3.2.1. Power Supply Requirements and Power Cord Routing

- The equipment is powered by a DC power source (20–24V)\*<sup>1</sup>, floating ground. The ship's power source must be capable of continuously supplying at least or 3A at 24 VDC for proper start-up and reliable operation.
- To minimize the chance of picking up extraneous electrical interference, it is highly recommended that the power cord be connected direct to the ship's power source, and not via other terminals or power distribution board that are used in common with other on-board electronics. Ideally, the equipment cabinet should be powered by an independent power supply for best results.

\*<sup>1</sup>: BSH-approved power source voltage range. The equipment safely operates over an 11–40V range.

#### 13.3.2.2. Connections

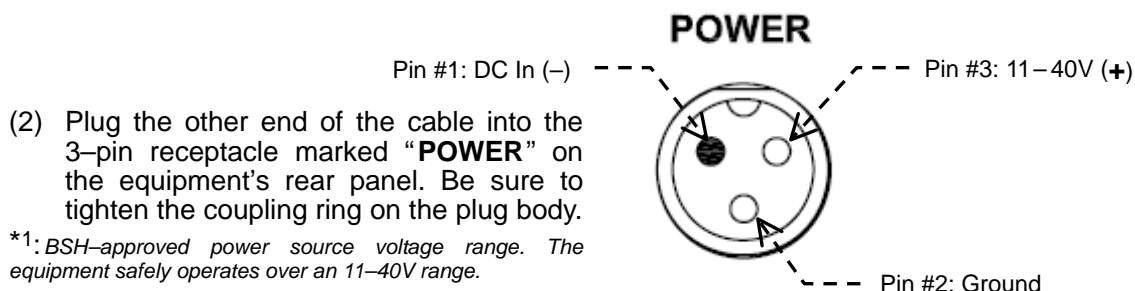
##### < WARNING >

**REVERSING THE POWER CORD POLARITY WILL BLOW THE FUSE THE INSTANT THE CORD IS PLUGGED INTO THE UNIT, EVEN IF IT IS SWITCHED OFF.**

(1) Connect the cable's conductors to the ship's power source as follows:

- White (or red) conductor: to positive (+) terminal (20 to 24 VDC)\*<sup>1</sup>
- Black conductor: to negative (–) terminal (DC In –)
- Shield (braid, green) : to ship's earth-grounding point (Ground)

Figure 13-6 **POWER** Receptacle Pin Assignments



(2) Plug the other end of the cable into the 3-pin receptacle marked "**POWER**" on the equipment's rear panel. Be sure to tighten the coupling ring on the plug body.

\*<sup>1</sup>: BSH-approved power source voltage range. The equipment safely operates over an 11–40V range.

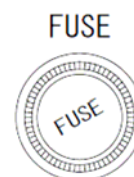
#### 13.3.2.3. Installing the Fuse

##### < WARNING >

**AN INCORRECTLY RATED FUSE OR INCORRECT TYPE FUSE WILL BLOW AT POWER-UP OR WILL NOT PROTECT THE EQUIPMENT IN THE REMOTE EVENT OF A TROUBLE OVERLOADING ITS POWER SUPPLY.**

- The equipment is usually delivered without a fuse installed in the rear panel fuse holder marked "**FUSE**."
- The appropriate fuse rating depends on the nominal power supply voltage, as follows:
  - **3A** (3 amperes) for operation off 12 VDC nominal
  - **2A** (2 amperes) for operation off 24 VDC or 32 VDC nominal
- Two pieces of each rating are separately supplied.
- Remove the fuse cap, install the correctly rated fuse in place, and replace the cap.

Figure 13-7 Fuse Holder



Fuse Size: 5.2 dia.X20 mm

#### 13.3.2.4. Grounding the Display Cabinet

Figure 13-8 Ground Terminal

- The display cabinet, which is electrostatically coated inside, can be grounded to the ship's earth ground without grounding the negative line of the power source.
- In installations where it is required, or desirable, to ground the cabinet for safety reasons or EMC\*1 compliance, connect from the wing nut-fitted ground terminal on the rear panel to the ship's nearest earth ground using a thick wire.
- The ground wire should be as short as possible to reduce the chance of picking up interference from other electronics.

**CABINET GND**



\*1: EMC = electromagnetic compatibility

#### 13.3.3. Connections to Transducer

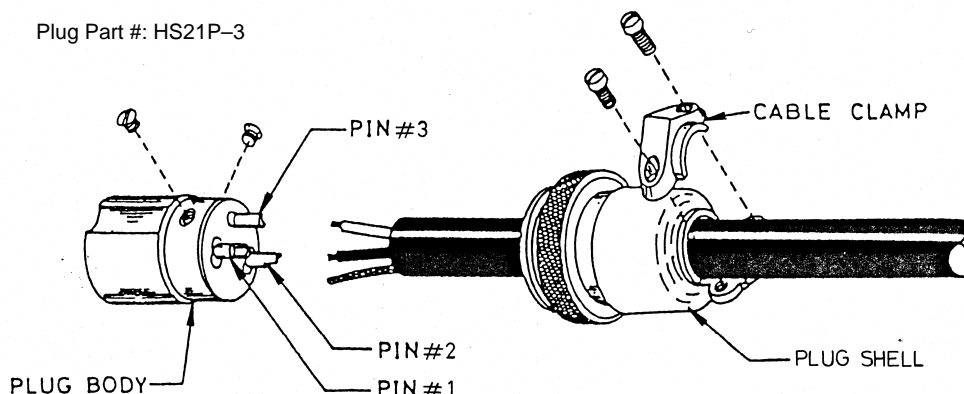
- The transducer is supplied with its integral cable. A three-hole female-type plug is separately supplied for terminating the cable for connection to the equipment cabinet.
- With the aid of the illustration below, disassemble the plug, taking care not to lose the small screws.

**< WARNING >**

**DO NOT TURN THE EQUIPMENT ON WITH THE TRANSDUCER PLACED IN THE AIR, OR DAMAGE TO THE TRANSDUCER CRYSTAL WILL RESULT.**

- **Cable Extensions:**
  - In installations where the existing integral cable must be extended, be sure to use the same type of cable supplied by the manufacturer.
  - Use of additional cable not approved by the manufacturer will seriously degrade the depth detection performance.
  - All joints must be made by soldering and properly insulated. "Twist-and-tape" connections must be avoided.
- **Coaxial cables are electrically unbalanced and cannot be used.**

Figure 13-9 Terminating Transducer Cable



- **Slide the plug shell over the cable first**, and solder the conductors to the three pins on the plug body as follows:
  - One conductor to: pin #1\*2
  - Shield (braid) to: pin #2
  - Other conductor to: pin #3\*2

\*2: Connections to pin #1 and pin #3 may be reversed without affecting transducer performance.



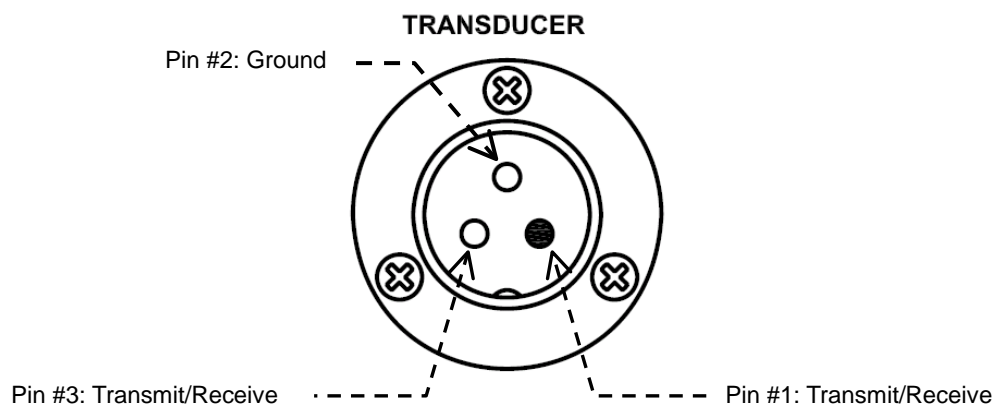
### 13.3.3. Connections to Transducer *(continued – 2/2)*

- The pin ID numbers are marked in raised letters on the face of the plug body.
- Pins #1 and #3 are balanced, and may be reversed.
- Care should be taken to ensure that no stray strands of wires or excess solder on any pin touches the inside wall of the plug shell when the plug is reassembled.
- Reassemble the plug, tightening the screws firmly.
- The transducer can now be plugged into the three-pin receptacle (**TRANSDUCER**, Figure 13-14) on the rear panel.
- Observe the **WARNING** below.

#### < WARNING >

- **EXTREMELY HIGH RADIO-FREQUENCY VOLTAGE PULSES ARE PRESENT ACROSS PINS #1 AND #3 ON THE TRANSDUCER RECEPTACLE WHEN THE EQUIPMENT IS SWITCHED ON, EXCEPT FOR THE SIMULATION MODE.**
- **BE SURE TO AVOID COMING INTO CONTACT WITH ANY OF THOSE PINS AND TO PLACE THE PROTECTIVE RUBBER CAP OVER THE CONNECTOR WHENEVER THE TRANSDUCER IS UNPLUGGED FROM THE CABINET.**
- Turn the equipment off, push the plug into the receptacle as far as it goes, and then screw the coupling ring onto the threaded part of the receptacle until it stops.
- **Receptacle Pin Assignments:**
  - Pin No. 1: Transmitter Output/Receiver Input
  - Pin No. 2: Cabinet Ground (isolated from power line)
  - Pin No. 3: Transmitter Output/Receiver Input

Figure 13-10 **TRANSDUCER** Receptacle Pin Assignments



*NOTE: Pins 1 and 3 are electrically balanced and may be reversed without affecting transducer performance.*

### 13.3.4. Connections through Digital I/O Interface Connectors

#### 13.3.4.1. Introduction

- The equipment is designed to interface with various external devices that output or accept digital data signals compliant with the IEC 61162-1 Ed. 5 or IEC 61162-1 Ed. 4 communications protocol. The rear-panel serial interface ports “**RS-422-A/B**” and “**I/O**” are provided for this purpose.

#### 13.3.4.2. Approved Digital Displays

- The following digital display units are approved by BSH as options to the echo sounder:
  - **Plath UDR**
  - **SKIPPER IR 301**
  - **9205T/ELAC DAZ 25/DEBEG 4650 T/FILIA 522**
  - **Consilium SD 2-3**
  - **SAM 4900**

#### 13.3.4.3. Input Data and Command Sentences

##### Input Data:

- The following IEC 61162-1/NMEA-0183 data sentences can be input via one of the above serial interface ports for display on-screen:
  - \$GPGGA (derives LAT/LON position fix only)
  - \$GPRMC (derives UTC date and time only, if \$GPZDA sentence is not available)
  - \$GPVTG (derives speed-over-ground and course-over-ground)
  - \$GPZDA (derives UTC date & time)

##### Input Commands for Alarm Acknowledgement:

- Depending on the alarm management protocol selected, either of the following two types of command sentences can be input from an INS/BAM terminal via one of the above interface ports to remotely acknowledge a currently active alarm:
  - \$--ACN, ,aaa,xxx,,c,a\*hh <CR><LF> (IEC 61162-1 Ed. 5 format command)
  - \$--ACK, xxx\*hh <CR><LF> (IEC 61162-1 Ed. 4 format command)
- The IEC 61162-1 Ed. 5 standard is initially selected. To use the IEC Ed. 4 standard, refer to paragraph 7.8.2.2.1 (Selecting Alarm Handling Protocols) for instructions.
- Refer to paragraph 7.8.2 (Acknowledging Active Alarms) for details about the sentence formats.
- For details about the alarm output sentences and other related output formats, see paragraph 13.3.4.5 (Alarm-Related Output Data Sentences).

#### 13.3.4.4. Navigational Output Data Sentences

##### **Realtime Depth Output Data** <sup>(1/2)</sup>

- The following IEC 61162-1/NMEA-0183 formatted depth data sentences can be output in real time at 4800 baud simultaneously via all serial interface ports (rear-panel **RS-422-A/B** and **I/O** connectors).
- No hand-shaking protocol is used to control data transfer.
- **Some of the outputs are initially disabled.** Refer to the relevant instructions given in paragraph 8.11 (Selecting Data Outputs) to enable the desired outputs to become available through the above interface ports.
- Alarm-related outputs cannot be disabled.

##### 1. \$SDDPT (depth with transducer draft or keel offset)

**\$SDDPT, X.X, X.X, X.X \* hh <CR> <LF>**

①      ②      ③      ④

- ① Depth below transducer, in meters
- ② Positive value represents transducer draft (transducer to waterline, in meters), and negative value represents keel offset (transducer to keel, in meters)
- ③ Range scale in use
- ④ Checksum

##### 2. \$PSKPDPT (proprietary depth data for **SKIPPER IR 301** digital depth repeater)

**\$PSKPDPT, X.X, X.X, X.X, , , FWD \* hh <CR> <LF>**

①      ②      ③      ④      ⑤      ⑥

- ① Depth below transducer, in meters
- ② Positive value represents transducer draft (transducer to waterline, in meters), and negative value represents keel offset (transducer to keel, in meters)
- ③ Range scale in use
- ④ Null fields (E/S channel number, bottom echo strength, etc. are not output)
- ⑤ Transducer location; FWD=forward, AFT=aft, MID\*<sup>1</sup>=middle
- ⑥ Checksum

\*<sup>1</sup>: Not supported by **SKIPPER IR 301**. See NOTES below.

##### NOTES:

- (1) Depth output data (\$PSKPDPT) required for depth-indicating operation of the **IR 301** is initially disabled. Be sure to turn the output (abbreviated "**PSKDPT**" on the menu) on via the procedure given in paragraph 8.11 when that remote unit is plugged into the rear-panel **I/O** connector.
- (2) The **IR 301** has only two transducer location indicator LEDs (forward and aft) on its display. When your system has one transducer mounted in the middle of the hull, the output includes location data "**MID**" in its string, which is not supported by the **IR 301**. Therefore the position of the selected transducer, when installed in the middle, will not be indicated on the **IR 301**. See paragraph 13.3.4.2 for data format information.

#### 13.3.4.4. Navigational Data Sentences *(continued – 2/3)*

##### **Realtime Depth Output Data** *(2/2)*

##### 3. \$SDDBT (depth below transducer)

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

①                      ②                      ③                      ④

- ① Depth below transducer, in feet
- ② Depth below transducer, in meters
- ③ Depth below transducer, in fathoms
- ④ Checksum

##### 4. \$SDDBK (depth below keel)

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

①                      ②                      ③                      ④

- ① Depth below keel, in feet
- ② Depth below keel, in meters
- ③ Depth below keel, in fathoms
- ④ Checksum

##### **Realtime GPS-Derived Output Data**

- The same sentences that are input to the equipment from an external GPS data source will be output without modification (e.g. \$GPGGA, \$GPRMC, \$GPVTG & \$GPZDA).
- Those output sentences are initially turned off.
- To make them available, see paragraph 8.11 (Selecting Data Outputs) for instructions.

#### 13.3.4.4. Navigational Data Sentences *(continued – 3/3)*

##### **On-demand Depth Output Data:**

- The following IEC 61162-1/NMEA-0183-compliant proprietary sentence can be output at 4800 baud on demand from the non-volatile (flash) memory. Refer to paragraph 10.2 for details.
- No hand-shaking protocol is used to control data transfer.
- The detailed sentence format is given below.

**\$PJMCN, X.X,X.X, X.X, 50, ddmmyy, hhmmss,** *(continued to next line)*

① ② ③ ④ ⑤ ⑥ ⑦

lll.lll, a, yyyy.yyy, a \* h h <CR><LF>

⑧ ⑨ ⑩ ⑪ ⑫

- ① Talker Identifier (proprietary)
- ② Depth below transducer\*<sup>1</sup> in meters, varying in length; null if depth information was unavailable (i.e. if bottom was not received in one of two strongest echo colors).
- ③ Offset\*<sup>1</sup>; positive (+) = transducer draft, negative (–) = offset from transducer to keel
- ④ Maximum depth range used; in meters\*<sup>2</sup>
- ⑤ Transducer frequency; 50 = 50 kHz, 100 = 100 kHz, 200 = 200 kHz
- ⑥ Date (day/month/year) referenced to UTC; fixed in length
- ⑦ UTC time (hours/minutes/seconds), derived from internal clock or from GPS time if valid position fix was available; fixed in length.
- ⑧ Latitude coordinate (to 1/1000 minutes), varying in length; null if valid GPS position fix was temporarily unavailable.
- ⑨ Latitude sign (N/S); null if valid GPS position fix was temporarily unavailable.
- ⑩ Longitude coordinate (to 1/1000 minutes), varying in length; null if valid GPS position fix was temporarily unavailable.
- ⑪ Longitude sign (E/W); null if valid GPS position fix was temporarily unavailable.
- ⑫ Checksum

\*<sup>1</sup>: If both offsets were entered, two \$PJMCN sentences will be output with the same DBT value; one contains the transducer draft, and the other, the keel offset.

\*<sup>2</sup>: If the depth measurement was made in fathoms or feet, the following metric values are used to represent the maximum depth range in use:

Table 13-2 Equivalent Maximum Range Scales in Fathoms and Feet

Value (m) ④	Max. range in fathoms	Value (m) ④	Max. range in feet
4.5m	2.5	6.1m	20
9.0m	5	12.2m	40
18.2m	10	30.6m	100
36.5m	20	61.2m	200
91.4m	50	122.5m	400
182.8m	100	306.4m	1000
365.7m	200	612.8m	2000
914.4m	500	1225.6m	4000

#### 13.3.4.5. Alarm-Related Output Data Sentences

#### 13.3.4.5.1. Introduction

- Depending on the alarm handling protocol employed for your INS/BAM alarm management system, the following two types of alarm-related outputs are available via the rear-panel **RS-422-A/B** and **I/O** serial interface ports simultaneously.
  - IEC 61162-1 Ed. 5 format outputs (default)
  - IEC 61162-1 Ed. 4 format outputs (optional)
- The desired protocol can be selected via the steps given in paragraph 7.8.2.2.1 (Selecting Alarm Handling Protocols).
- Depending on the protocol selected, those outputs become available:
  - the instant an alarm condition occurs and its corresponding alarm gets activated;
  - when the appropriate command is entered via one of the above interface ports;
  - when the active alarm is manually acknowledged by pressing the specified key on the equipment's control panel or by closing one of the built-in relays with a remote switch connected to the rear-panel **ALARM ACK** connector; or
  - at all times regardless of the current alarm status.
- The appropriate command sentence formats and related information are given in paragraph 7.8.2 (Acknowledging Active Alarms).
- The power-removal/shutdown alarm operates independently from the alarm management system, and only the audible alarm indication is available when it is triggered.

#### 13.3.4.5.2. Output Sentences for IEC 61162–1 Ed. 4 Alarm Handling Protocol

- The following alarm output sentences will be available for each alarm type, every 60 seconds or 30 seconds, except for the power-removal/shutdown alarm, depending on whether the alarm becomes active or is acknowledged manually on the equipment's control panel or by the corresponding software command (paragraph 13.3.4.3, **Input Data and Command Sentences**).

\$SDALR,xxxxxx,xxx,A,V,ECHO SOUNDER:Depth alarm\*hh<CR><LF>

①            ②      ③     ④                          ⑤                          ⑥

- ① UTC in hours, minutes and seconds; e.g. 141200 =14 hours, 12 minutes, 00 seconds
- ② Local alarm number:
- 001=Depth,      - 002=Bottom-missing\*1,      - 003= Power failure/Low voltage

\*1: The bottom-missing alarm function is initially disabled, and no output data will be available even if the alarm condition exists. To enable the function, see paragraph 8.12 for instructions.

- ③ Alarm activity status:
  - A=active (i.e. alarm condition exists),      - V=inactive (i.e. alarm condition is non-existent)
- ④ Alarm acknowledgement status:
  - A=acknowledged,      - V=unacknowledged
- ⑤ Alarm description text
  - ECHO SOUNDER:Depth alarm
  - ECHO SOUNDER:Bottom-missing alarm
  - ECHO SOUNDER:Power Failure/low voltage alarm
- ⑥ Checksum

#### 13.3.4.5. Alarm-Related Output Data Sentences *(continued – 2/6)*

##### 13.3.4.5.3. Alarm Output Intervals for IEC 61162-1 Ed. 4 Alarm Handling Protocol

(1) When none of the alarms is currently active:

- The echo sounder will output the following sentences every 60 seconds:
  - \$SDALR,xxxxxx,001,V,V,ECHO SOUNDER:Depth alarm\*hh<CR><LF>
  - \$SDALR,xxxxxx,002,V,V,ECHO SOUNDER:Bottom missing alarm\*hh<CR><LF>
  - \$SDALR,xxxxxx,003,V,V,ECHO SOUNDER:Low voltage alarm\*hh<CR><LF>

(2) When an alarm condition occurs *(1/2)*:

• **Depth alarm (local alarm # 001)**

- The instance the depth registers at, or above, the user-preset depth, the echo sounder will output the following sentence:  
\$SDALR,xxxxxx,001,A,V,ECHO SOUNDER:Depth alarm\*hh<CR><LF>
- The above sentence will be repeated every 30 seconds.
- Upon pressing of **CLR** or receiving an ACK command\*1 for local alarm #001 from the INS, the echo sounder will change the alarm acknowledgement status as follows:  
\$SDALR,xxxxxx,001,A,A,ECHO SOUNDER:Depth alarm\*hh<CR><LF>
- The above sentence will be repeated every 30 seconds.
- The instance the depth registers below the preset limit again, the sounder will change the alarm status back to its normal condition again, as follows:  
\$SDALR,xxxxxx,001,V,V,ECHO SOUNDER:Depth alarm\*hh<CR><LF>
- The above output will be repeated every 60 seconds.

\*1: \$\_\_ACK,001,\*hh<CR><LF> to acknowledge depth alarm

• **Bottom-missing alarm (local alarm # 002)**

- The output will be available only when the relevant function setting (via **MAIN MENU → 9: INSTALLATION SETTINGS → 9: BOTTOM MISSING ALM** path) is set to **ON**.
- The instant the bottom echo is lost, the audible alarm will be activated, and at the same time the following sentence will be output every 30 seconds:  
\$SDALR,xxxxxx,002,A,V,ECHO SOUNDER:Bottom missing alarm\*hh<CR><LF>
- Five seconds later, the alarm sound alone will be automatically turned off, but the above sentence will continue at 30-second intervals.
- The sound cannot be silenced with **CLR** during the above 5-second period, but can be turned off with an ACK command\*2.
- After receiving an ACK command\*2 for local alarm 002 from the INS, the echo sounder will output the following sentence:  
\$SDALR,xxxxxx,002,A,A,ECHO SOUNDER:Bottom missing alarm\*hh<CR><LF>
- The above sentence will then be repeated at 30-second intervals.
- Upon recovering of the bottom echo, the sounder will change the alarm acknowledgement status to the normal condition as follows:  
\$SDALR,xxxxxx,002,V,V,ECHO SOUNDER:Bottom missing alarm\*hh<CR><LF>
- The above sentence output will then be repeated at 60-second intervals.

\*2: \$\_\_ACK,002,\*hh<CR><LF> to acknowledge active bottom-missing alarm

13.3.4.5. Alarm-Related Output Data Sentences *(continued – 3/6)*

13.3.4.5.3. Alarm Output Intervals for IEC 61162-1 Ed. 4 Alarm Handling Protocol – 2/2)

(2) When an alarm condition occurs (2/2):

- **Low voltage/Power failure Alarm (local alarm # 003)**

- The instance the DC power source voltage falls to, or below, the factory-preset level (11.0V) , the sounder will output the following sentence:

\$SDALR , xxxxxxx, 003, **A**, V, ECHO SOUNDER: Low voltage alarm\*hh <CR><LF>

- The above sentence will be repeated every 30 seconds.
- Upon pressing of **CLR** or receiving an ACK command\*1 for local alarm #003 from the INS, the sounder will change the alarm acknowledgement status as follows:

\$SDALR , xxxxxxx, 003, A, **A**, ECHO SOUNDER: Low voltage alarm\*hh <CR><LF>

- The above sentence will be repeated every 30 seconds.
- The instance the voltage rises again above the preset limit, the sounder will change the alarm status as follows:

\$SDALR , xxxxxxx, 003, **V**, **V**, ECHO SOUNDER: Low voltage alarm\*hh <CR><LF>

- The above output will be repeated every 60 seconds.

\*1: \$\_\_ ACK , 003, \* hh <CR><LF> to acknowledge active low voltage alarm



#### 13.3.4.5. Alarm-Related Output Data Sentences *(continued – 4/6)*

##### 13.3.4.5.4. Output Sentences for IEC 61162-1 Ed. 5 Alert Handling Protocol *(1/3)*

- The following description applies if the receiver uses the default IEC 61162-1 Ed. 5 (2016) communications protocol standard for alert management.
- To return to the default IEC 61162-1 Ed. 4 (2010) protocol, refer to paragraph 7.8.2.2.1 (Selecting Alarm Handling Protocols) for instructions.
- An alert output sentence like the example below will be output via the serial interface ports (rear-panel **RS-422-A/B** and **I/O** connectors) when an alert condition develops or when an alert request is received from the INS/BAM system.
- \$SDALF Alert Output Sentence *(1/2)*

Figure 13-11 ALF Sentence Format – Example

```
$SDALF, 1, 1, 3, 101420, B, C, V, JMC, 230, (continued to next line)
  ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
    1, 4, 0, DEPTH BELOW KEEL * 4B <CR> <LF>
  ⑩ ⑪ ⑫ ⑬ ⑭
```

- ① Total number of ALF sentences for this message: 1, fixed
- ② Sentence number: 1, fixed
- ③ Sequential message identifier: 3 (0 – 9)
- ④ Time of last change: 101420 (=10 hrs. 14 min. and 20 sec. in this example)
- ⑤ Alert category: B (=Category B alert\*1)
- ⑥ Alert priority: C (=Caution)
- ⑦ Alert state transition: V (=active – unacknowledged)
  - U = rectified (resolved) – unacknowledged
  - V = active – unacknowledged
  - A = active – acknowledged
  - S = silenced
  - O = responsibility transferred
  - N = normal state
- ⑧ Manufacturer mnemonic code: JMC (=Japan Marina Co. Ltd.)
- ⑨ Alert identifier: 230 (=depth-below-keel alarm)
  - 230 = Depth-below-keel alarm (output text = "DEPTH BELOW KEEL")
  - 231 = Power supply failure alarm (output text = "POWER FAIL")
- ⑩ Alert instance: 1
- ⑪ Revision counter: 4 (1 – 99)
- ⑫ Escalation counter: 0, fixed
- ⑬ Alert text (depth-below-keel alarm in this example)
- ⑭ Checksum: 4B hex

\*1: Category B alert where no additional information for decision support is needed besides the information which can be presented using alert source and alert description text (IEC 61162-1 definition).

#### 13.3.4.5. Alarm-Related Output Data Sentences *(continued – 5/6)*

##### 13.3.4.5.4. Output Sentences for IEC 61162-1 Ed. 5 Alert Handling Protocol *(2/3)*


- \$SDALF Alert Output Sentence *(2/2)*
- When the above alert is acknowledged (manually by pressing ) , the sentence format will change as in the example below.

Figure 13-12 Format of ALF Sentence with Acknowledged Alert – Example

\$SDALF , 1 , 1 , 4 , 101423 , B , C , A , JMC , 230 , *(continued to next line)*

③      ④                      ⑦

1 , 5 , 0 , DEPTH BELOW KEEL \* 59

⑪    ⑭

- ③ Sequential message identifier: 4
- ④ Time of last change: 10:14:23
- ⑦ Alert state transition: A (= active – acknowledged)
- ⑪ Revision counter: 5
- ⑭ Checksum: 59 hex
- In addition to the above ALF sentence, the following two additional alert-related sentences will be output:
  - \$SDALC Sentence: Cyclic Alert List
  - \$SDHBT Sentence: Heartbeat Supervision
- An example format for each sentence is given below.
- \$SDALC Cyclic Alert List Sentences *(1/2)*
  - This sentence is output at least once every 30 seconds, regardless of whether either of the alarms is active or not.
  - When a single alert condition exists, a sentence like the following example format will be output:

Figure 13-13 Format of ALC Sentence with Active Depth Alarm – Example

\$SDALC , 01 , 01 , 32 , 1 , JMC , 230 , 1 , 4 \* 19 <CR> <LF>

①   ②   ③   ④   ⑤   ⑥   ⑦   ⑧   ⑨

- ① Total number of sentences for this message: 01
- ② Sentence number: 01
- ③ Sequential message identifier: 32
- ④ Number of alert entries: 1
- ⑤ Manufacturer mnemonic code: JMC
- ⑥ Alert identifier: 230 (=depth-below-keel alarm)
- ⑦ Alert instance: 1
- ⑧ Revision counter: 4
- ⑨ Checksum: 19 hex

#### 13.3.4.5. Alarm-Related Output Data Sentences *(continued – 6/6)*

##### 13.3.4.5.4. Output Sentences for IEC 61162-1 Ed. 5 Alert Handling Protocol *(3/3)*

- \$SDALC Cyclic Alert List Sentences *(2/2)*

- When two alert conditions (alert ID 230=depth-below-keel alarm and alert ID 231=power failure alarm) simultaneously exist, a sentence like the following example format will be output:

Figure 13-14 Format of ALC Sentence with Dual Alert Entries – Example

\$SDALC , 01 , 01 , 46 , 2 , JMC , 230 , 1 , 63 , JMC , 231 , 1 , 65 \* 6E <CR> <LF>

④
⑥
⑧
⑩
⑪

- ④ Number of alert entries: 2
- ⑥ Alert identifier: 230 (=depth-below-keel alarm)
- ⑧ Revision counter: 63
- ⑩ Alert identifier: 231 (=power failure alarm)
- ⑪ Revision counter: 65

- When there is no active alert, fields ⑤ to ⑧ in the sentence will be omitted, as in the example below.

Figure 13-15 Format of ALC Sentence with No Alert Entry – Example

SDALC , 01 , 01 , 00 , 0 \* 69 <CR> <LF>

①
②
③
④
⑨

- ① Total number of sentences for this message: 01
- ② Sentence number: 01
- ③ Sequential message identifier: 00
- ④ Number of alert entries: 0
- ⑨ Checksum: 69 hex

- \$SDHBT Heartbeat Supervision Sentences

- This sentence is normally output at 120-second intervals in the following format:

Figure 13-16 Normal Output Format of HBT Sentence – Example

\$SDHBT , 120 , A , 0 \* 27 <CR> <LF>

①
②
③
④

- ① Configured autonomous repeat interval in seconds\*1 : 120 seconds
- ② Equipment operating status: A (=Equipment is in normal operation)
  - A = Equipment is in normal operation. V = Equipment is not in normal operation.
- ③ Sequential sentence identifier\*2 : 0
- ④ Checksum: 27 hex

- When a query command\*3 is entered from one of the serial ports, the format will change like the example below, replacing the repeat interval field ① with a null field.

Figure 13-17 On-Demand Output Format of HBT Sentence – Example

\$SDHBT , , A , 9 \* 00 <CR> <LF>

①
②
③
④

- ① Configured autonomous repeat interval: null

\*1: 120 seconds, fixed

\*2: This field provides a message ID number from 0 to 9 that is assigned sequentially and is incremented for each new sentence. After number 9 is reached, the field resets to 0.

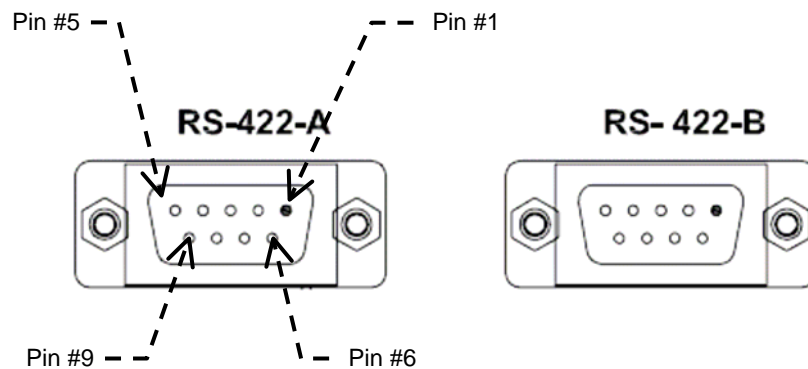
\*3: IEC-61162-1 format command, e.g. \$CASDQ , HBT \* 36 <CR> <LF>

#### 13.3.4. Connections through Digital I/O Interface Connectors

##### 13.3.4.6. Connector Pin Assignments

- **RS-422 Connector Pin Assignments**
  - Connections from an INS/BAM terminal are to be plugged into this receptacle.
  - A D-sub 9 female-type plug\*1 mates with this connector.
  - The pin assignments are illustrated below.

Figure 13-18 **RS-422** Connector Pin Assignments



- Of the nine pins, the following are used for data communication, and the rest, left unused:
  - Pin #5: Ground
  - Pin #6: RX+ (RX DATA +)
  - Pin #7: RX- (RX DATA -)
  - Pin #8: TX+ (TX DATA +)
  - Pin #9: TX- (TX DATA -)

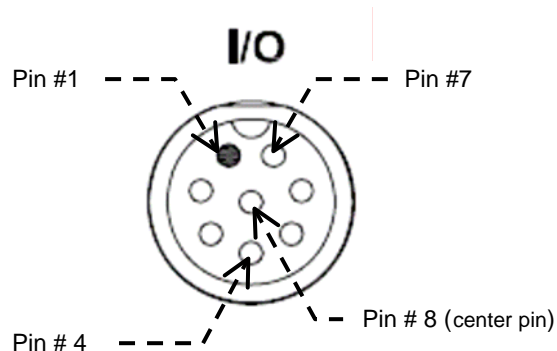
\*1: HDEB-9S (or equivalent) optionally supplied

### 13.3.4. Connections through Digital I/O Interface Connectors

#### 13.3.4.6. Connector Pin Assignments (*continued – 2/2*)

- **I/O Data Connector Pin Assignments**
  - The eight pins are identified as illustrated below.
  - The mating plug (part # CP111-8P) is separately supplied as standard.

Figure 13-19 **I/O Data Connector Pin Assignments**



- The pins are assigned the following functions:
  - Pin #1: RXD + (IEC 61162-1/NMEA-0183 input from GPS/INS device)
  - Pin #2: RXD - /TXD- (Common to RXD-/TXD-)
  - Pin #3: TXD + (IEC 61162-1/NMEA-0183 output)
  - Pin #4: FWE, Enables programming mode. **(Do not connect any device except when updating software)** See **<CAUTION>** below.
  - Pin #5: TXD } Programming data I/O, with hand-shaking
  - Pin #6: RXD }
  - Pin #7: 12 VDC output, 200 mA maximum  
See **NOTE** and **<WARNING>** below.
  - Pin #8: Chassis Ground
- Connections should be made using a short length of good quality two-conductor shielded cable.
- To avoid interference, the shield should be grounded at both the equipment cabinet and the external device connected.
- Use pin #8 for grounding on the cabinet side.

**NOTE:** A 12V regulated DC voltage is available from pins #7 (+) and #8 (ground) for powering light-duty external devices, such as a GPS sensor. See **<WARNING>** below.

#### **< WARNING >**

**THE DC OUTPUT IS CURRENT-LIMITED TO 1A FOR PROTECTION AGAINST A MOMENTARY SHORT. HOWEVER THE CURRENT DRAIN MUST NOT EXCEED 200 MA AT ANY TIME FOR CONTINUOUS-DUTY APPLICATIONS.**

#### **< CAUTION >**

**Connecting any device other than the specified programmer to this pin can cause the equipment to be locked or to work erratically.**

### 13.3.5. Connections to ALARM ACK Connector

- If you wish to acknowledge and reset an active alarm (**DEPTH ALARM** or **POWER FAILURE/LOW VOLTAGE ALARM**) with a switch located away from the equipment, connect a suitable single-pole-single-throw (SPST) switch to this connector so that the two pins on the connector get short-circuited together when the switch is turned on (or closed).
- No polarity consideration is required.

Figure 13-20 **ALARM ACK** Connector Pin Assignments

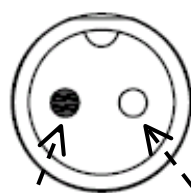
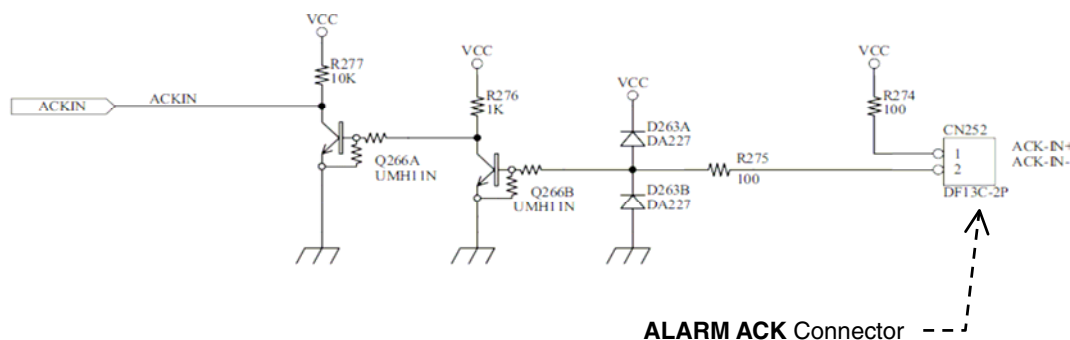
- ALARM ACK**
- 
- Matched Plug: CP111-2P\*1
  - When the above pins are shorted together, the audible indication for the depth alarm and low voltage/power failure alarm will be turned off.
  - The open/closed status of pins #1-#2 and #5-#6 pairs on the **ALARM OUT** connector will remain unchanged when the **ALARM ACK** pins are shorted together.
  - See paragraph 13.3.6 for related information.
  - Technical Information
    - The two pins (ACK+ and ACK-) on the connector are a pair of normally open solid state relay contacts with approx. 3.3V on the ACK+ pin.
    - Shorting these pins together with an external on/off switch will cause approx. 0.3mA current to flow through the relay drive transistors, enabling the equipment to detect an alarm acknowledgement signal.

Figure 13-21 **ALARM ACK** Connector Circuit

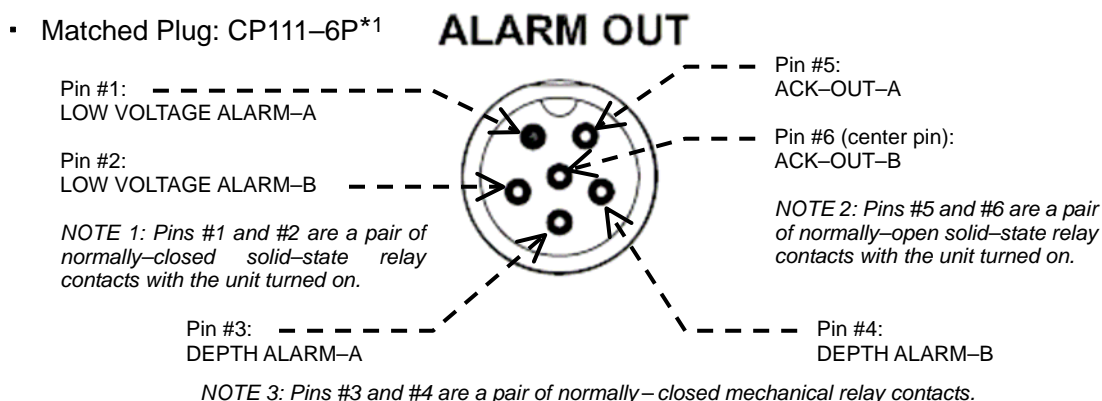


\*1: separately supplied as standard

### 13.3.6. Connections to ALARM OUT Connector

- The **ALARM OUT** connector is provided to separately drive remotely mounted alarm condition indicating devices when either the **POWER FAILURE/LOW VOLTAGE ALARM** or the **DEPTH ALARM** becomes active, and to allow the user to acknowledge and reset the active alarm from such a location.
- The pin assignments are illustrated below.
- The open/closed status of the relay contacts assumes that the equipment is currently in its energized condition (turned on).

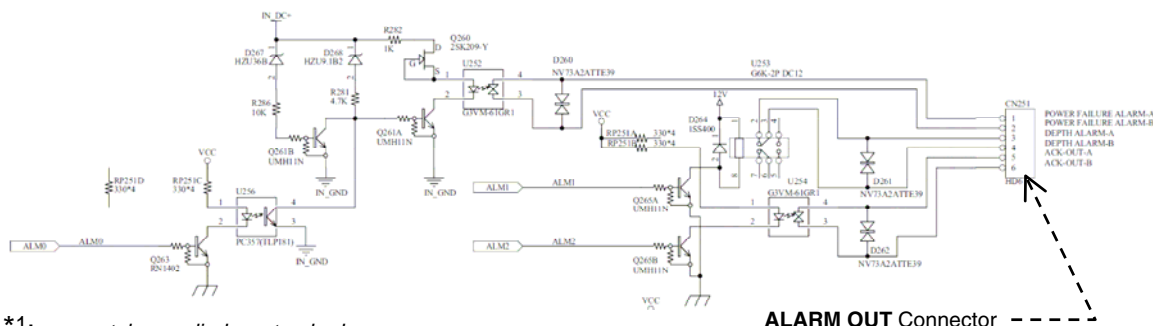
Figure 13-22 **ALARM OUT** Connector Pin Assignments



- Pins #1 and #2: These pins are connected to a pair of normally-closed solid-state relay contacts, which will open when the **POWER FAILURE/LOW VOLTAGE ALARM** is triggered.  
Maximum contact ratings: 60V AC/DC, 1A
- Pins #3 and #4: These pins are connected to a pair of normally-closed mechanical relay contacts, which will open when the **DEPTH ALARM** is triggered.  
Maximum contact ratings: 125V AC/60V DC, 0.3A AC/1A DC
- Pins #5 and #6: These pins are connected to a pair of normally-open solid-state relay contacts, which will be closed for 3 seconds when **CLR** is pressed.  
Closure of pins #5 and #6 is used to inform the connected application that the active alarm was reset.  
Maximum contact ratings: 60V AC/DC, 1A

NOTE 4: The open/closed status of this pin pair is not affected when the **ALARM ACK** connector pins are shorted with a user-actuated remote switch.

Figure 13-23 **ALARM OUT** Connector Circuit



## 14. Recommended Spare Parts

- A list of the spare parts recommended for the maintenance and servicing for three to five years is given below.
- Replacing parts should be done by your dealer or a qualified service engineer.
- The part numbers of PCB's to be delivered may slightly change depending on the production lot; however, spare PCB's will be plug-for-plug compatible with the existing ones in the unit.

### < CAUTION >

**There are no user serviceable parts inside the display cabinet. The user should not open the cabinet for inspection, replacing suspected parts, or attempting to change the alignments/hardware settings.**

Table 14-1 Recommended Spare Parts

Part Name	Part Number	Quantity
▪ Fuses		
- for 12V DC operation:	3A/5.2X20mm	2
- for 24V/32V DC operation:	2A/5.2X20mm	2
▪ Connector Plugs		
- <b>POWER</b> Plug:	CP111-3P	1
- <b>TRANSDUCER</b> Plug:	HS21P-3	
- <b>I/O</b> Plug*1:	CP111-8P	1
- <b>RS-422-A/B</b> Plug*1:	HDEB-9S	1
- <b>ALARM ACK</b> Plug*1:	CP111-2P	1
- <b>ALARM OUT</b> Plug*1:	CP111-6P	1
▪ Power Cord (terminated in mating plug):	M402-PW01	1
▪ Printed Circuit Boards (PCBs)		
- Transceiver PCB*2 (50 kHz):	M815-T50	1
- Transceiver PCB*2 (200 kHz):	M815-T200	
- Main PCB:	M815-MAIN-B*3	1
- Key PCB:	M815-KEY-A*3	1
▪ TFT-LCD Module (LCD panel):	LQ057AC111	1
-----		
*1: Not needed unless these connections are used for your installation.		
*2: Specify the transducer frequency of your installation when ordering. These boards are designed to match the specified <b>TOKIN</b> transducers only.		
*3: Production lot number; subject to change		







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