Introduction

EMES60 is a combined echo sounder and speed log, providing both speed and water depth from the same unit.

This manual gives the information necessary to use the Echo sounder system.
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1 About this Manual

1.1 Glossary

Terms used in this manual include:

DIV
Division

echo sounder
A device that measures the depth of water under a ship, by measuring the time between sending a sound pulse and receiving its echo from the seabed

electromagnetic log
A type of speed log that uses electromagnetic measurements to calculate the speed of a vessel through water. Compare with acoustic Doppler log, which calculates the speed through the water or relative to the seabed by detecting shifts in frequency of acoustic echoes. EMES60 uses an electromagnetic log.

HMI
Human-machine interface: screen units that give readouts of speed and depth, and allow the user to control and set up the system

IMO
International Maritime Organization

Interface Unit
EMES60 electronic unit that connects sensor, Sensor Power Unit and ship’s power

longitudinal speed
Speed in the aft-fore direction of the vessel

opto
Short for “opto-isolated”

opto-isolated
An electrical input that is separated electrically from the inputting device using an optical converter circuit

Sensor Power Unit
EMES60 electronic unit that connects HMI units, external equipment and Interface Unit

speed log
A device that measures the speed of a ship relative to the water around it and the seabed under it

TVG
Time Varied Gain, signal compensation that removes transmission loss effects from echosounder data

transducer
A device that converts electrical signals to sound and back again

transverse speed
Speed in the port-starboard direction of the vessel
swipe technique  Touch and drag – common scrolling technique applicable to the touch screens.

1.2 Parts of the Manual

- Section 1, About this Manual, introduces this manual.
- Section 2, Introduction to EMES60, provides an overview of the system.
- Section 3 and 4, Operation, describes the day-to-day operation of the system, including how to use the information and control screens.
- Section 5 provides EMES60 System Specifications.
2 Introduction to EMES60

2.1 Summary
EMES60 is a combined electromagnetic speed log and echosounder navigation system. It is a single sensor with two transducers in one housing. Both parts have been designed to meet the relevant international standards and provide all the modern and legacy input-output interfaces that are specified by the IMO standards. As required by the relevant regulations, the two parts are totally separated internally. The main advantage of this arrangement is that the system only needs one hull penetration, and one set of mounting hardware, thus increasing reliability and reducing costs of installation and maintenance. The size and weight of the sensor is significantly less than other systems on the market, which greatly facilitates installation and handling.

2.2 Highlights
- Only one hull penetration, which increases safety of navigation
- Small overall diameter of sensor, requiring small hull penetration, which minimizes the risk of mechanical damage
- Sophisticated analog and digital signal processing, which provides reliable data in any navigation conditions
- All modern and legacy input-output interfaces are supported, including IEC 61162-1
- Sound speed calibration based on temperature, which provides accurate depth measurements in different conditions without the need for manual adjustments
- Includes water temperature sensor, accurate to 1°C
- Optimized electromagnetic log operational parameters, which provides accurate speed through water measurements in different water conditions, such as sea water, river water, and brackish water
2.3 System Structure

SYSTEM STRUCTURE
EMES60 Echosounder and Speedlog Redundant HMI units

Dual Universal Marine Interface unit

External equipment

EMES Dual power supply and junction box

Sea ball valve for single and double hull mounting
### 3 Operation, generic

#### 3.1 HMI Touch-Screen Controls

Reading the speed and depth information from the system, and configuring the system for use, is done through the touch-screen display units, called “human-machine interface” (HMI) units. Data is also sent to external equipment using a range of standard communication protocols and data formats.

Two HMI Units are usually fitted, both of which can run both the echosounder and speed log parts of the system, but typically one is configured to run the echosounder, and the other is configured to run the speed log.

The HMI Units use touch-screen technology, so that controlling the system is done by touching the relevant part of the HMI Unit screen.

The structure and operation of both HMI units is similar. The examples below are from the echosounder, but the principles are the same for the speed log.

#### 3.2 Structure of the operational screen

- **Main window:** different for each system and each screen type

- **Settings buttons:** touch to change settings and **Home** access, screen

- **Simulation mode indicator**

- **GNSS and THD sensors data, ref 3.3**

- **Miscellaneous buttons, ref 3.5**
The exact contents of the parts of the screen are different for each screen type; see the section for each screen for detailed information.

### 3.3 GNSS and THD sensors data
All the screens show GNSS and THD sensor data received by the system in the top row of the screen.

- **GNSS receivers speed**
- **Heading**
- **Position, Northing**
- **Position, Easting**

This section can be enabled or disabled using the GPS Display on/off button at the top of the Home screen.

### 3.4 Using the on-screen keyboard to enter data

On-screen keyboard is used to change some of the user adjustable settings. The upper line contains the name of the edited parameter. The operator should enter the desired value and press the “enter” button. Backspace button can be used to delete the characters to the left from the cursor. In order to cancel operation without saving the changes – press the Esc button or touch any area outside the keyboard frame.
3.5 **Miscellaneous buttons**

The second row has a set of buttons, which provide numerical outputs as well as controls for the system. Each screen type is slightly different, but a typical one is as follows.

3.6 **Administrator mode**

EMES60 has two input modes: “Normal User” and “Administrator”.

Some operational parameters could prevent correct operation of EMES60 if they are set incorrectly. These parameters cannot be set in Normal User mode, and the operator must change to Administrator mode in order to get access to the setup screens.

All setup, calibration and troubleshooting screens are accessible only in Administrator mode.

The system starts in Normal User mode. To change to Administrator mode, go to the Home Screen (ref 3.7), and enter the Administrator password in the “Password” section. The administrator password is 1963.

The current input mode is shown at the bottom of the screen.

3.7 **Home screen**

Touch the button in the bottom-right of most screens to access the Home screen.
### 3.7.1 Home screen layout

The Home screens of the Echosounder and Speed Log interfaces are similar, but a different selection of screens is available for each.

**Screen selection:** touch to select an operational screen

### 3.7.2 Home screen upper line

- **Date:** touch to change
- **SW version andserial number of Interface Unit:** touch to upgrade software
- **SW version and serial number of Sensor Unit:** touch to upgrade software
- **SW version and serial number of HMI (Display) Unit:** touch to upgrade software
3.7.3 Home screen second line

3.7.4 Home screen Control buttons

**Day/Night** mode: touch to toggle between Day and Night display modes. The button shows the current mode. In night mode, the display is shown in darker colors, to preserve the night vision of the user. A sun icon is shown in Day mode, and a moon in Night mode.

**Defaults**: sets the system settings to default values.

You are then presented with the option of restoring to either the ship’s defaults (see below) or factory defaults.

An “Are You Sure” screen appears when the tick button is touched. Touch “OK” to return all the settings of the system to the selected set of settings.

**Store ship’s default settings**: stores the current settings of EMES60. This function is recommended after the required setup is performed. Then it will be easy to restore the original settings in case of accidental loss of the settings. Also see Saving Files to USB, section 7.1.

**Return to Screen**: returns the display to the previous operational screen.
**Standby**: turns the system in Standby mode. An “Are You Sure” screen appears when this button is touched. Touch “OK” to turn the system in Standby mode.

### 3.8 Alerts

#### 3.8.1 Alerts basics

If a value goes over a minimum or maximum limit, or functional failure occurs, an alert will be triggered. This causes the following things to happen:

- A flashing text indicator is shown in a prominent position on the screen
- The alert state is logged to an alert list, with the time stamp of the alert status change
- The potential free relays in the Interface Unit can be activated (depending on the settings of each relay function, ref section 6.6.4). These can be used to trigger audible alerts or set alerts in other systems.

To acknowledge an alert, causing the on-screen warning to disappear, touch the flashing warning box. More than one alert condition could be in place at the same time, so it may be necessary to repeat this procedure to acknowledge the other alerts.

The alert parameters are adjusted, controlled and monitored using the Alert screens, ref sections 4.4 and 5.4

The “loudspeaker” button is on provided in the second line of each screen. The color of the button depends on the existing alarm conditions. If any alarm condition exists – the button is red, otherwise – grey. Touch the “loudspeaker” button and the active alarms list will appear.

Alarm status can be “Active” or “Inactive”

Acknowledge status can be “A” (Acknowledged) or “N” (Not acknowledged)

This way it is always possible to check the alarms status after they has been acknowledged.

#### 3.8.2 Generic alert conditions

There are several alert types, which are common for both echosounder and speed log systems.
These are:

<table>
<thead>
<tr>
<th>Void</th>
</tr>
</thead>
<tbody>
<tr>
<td>Void</td>
</tr>
<tr>
<td>void</td>
</tr>
</tbody>
</table>

The alert types which are specific to one of the systems are explained in 4.4 and 5.4

### 3.8.3 Setting alert limits

The values at which alert is triggered are shown in Alert Buttons at the bottom of the screen. There are two buttons, one for the alert when the value gets too low, and one for when it gets too high.

To change these values, touch one of the Alert buttons.
A digital keyboard appears on the screen; Enter the desired value in the edit line and press “Enter” button.
The value in the Alert button changes to show the new selection.

### 3.9 Screens navigation

Use the Screens Navigation part of the screen to go directly to a different screen: touch the dot for the required screen.

Alternatively, “swipe” to left or right to move to an adjacent screen. The current screen is shown as a filled dot.

**IMPORTANT NOTE:** Entire set of screens is available only in admin mode, ref 3.6. In the user mode there are only basic screens (which are needed for a daily use) can be selected.
3.10 Brightness control

Double-tap in any screen area, and a brightness control slider is shown. Slide it up and down to increase and decrease the brightness of the HMI screen.

If the brightness is set so low that the screen picture is not visible under the present ambient light conditions - touch any part of the screen and keep touched for ca. 3 seconds. The brightness will change to a value so the elements of the screen are visible in all light conditions.

3.11 Hardware interface setup

3.11.1 Screen layout

This screen is used to program the Interface Unit according to the specific requirements of the installation. This screen can be accessed from both speed log and echosounder modes.

The default settings can be restored when necessary
The following outputs are available:

3.11.2 **Relay outputs**
These are controlled from the Alerts screen (ref 4.4 and 5.4). Ref 6.5.25 for connections details.

3.11.3 **Opto outputs**
Two opto output channels are provided. Touch the box next to each opto channel to assign the function to this channel. Select “Not Used” if no action is needed on that channel. The functionality is different for speed log and echosounder systems. Ref 4.6.7 and 5.6.7 for further details. Factory default: Not used.
3.11.4 Pulse inputs
A signal received from an external system can be selected to cause an action in the EMES60 system.
Two pulse input channels are provided. The functionality is different for speed log and echosounder systems. Ref 4.6.5 and 5.6.4 for further details.
Ref 8.2.6 for input connection details.
Factory default: Not used

3.11.5 Analog outputs
Analog outputs can be configured to provide a varying voltage output in response to a measured value in the EMES60 system. Two analog output channels are provided.
Touch the first box next to the channel number to switch between 0 to 10 V voltage output and 4 to 20 mA current output.
The functionality is different for speed log and echosounder systems. Ref 4.6.8 and 5.6.8 for further details.
Factory default: Not used

3.11.6 Screen copy and printing
Controls what happens when the Print Screen button at the top of most windows is touched.
Touch Printer to send screen copy images to a printer, and File to send them to a file, stored in the HMI memory.

Touch this box to select the printer from a list of available system printers.

3.12 Demo and Simulation modes
EMES60 can be put into special modes, to help with training and testing.
Demo and simulation modes are set in the Home screens; touch the mode button and select the required mode. **Warning:** ensure that the mode is set to Normal when EMES60 is used for navigation.

The available modes are:

- **Normal**: the information shown in the screens and the outputs from the external interfaces are driven by the measurements made by the speed log and echo sounder sensors.
- **Demo**: the screens are driven by artificial speed log and echo sounder data, which is computed inside the EMES60 software. This mode is supposed to be used for presentations.
- **Simul**: simulation mode; in this mode, the screens and outputs are also driven by data computed by the EMES60 software, but the operator can program the parameters of the data that is shown and output. This is useful for training and checking the connections to the external equipment, when real data from the sensor head is not available.

To set the simulation parameters: select simulation mode, then go back to screen 1. Click in the area of the digital depth (or digital speed) indicator – to change the simulated data.

Note that when either demo or simulator mode is activated the large character S is indicated in the upper right part of all screens.

### 3.13 Printing and screen snapshots

Touch the Print Screen button to send data from the screen to a printer or to the file screen for debug and maintenance purposes.

In Echosounder mode, keep this button touched for 3 seconds and this will start a continuous printout of the echogram and the GPS position data.

The function of this button is controlled by the selection of the Screen copy alternatives in the Hardware Interface Selection screen (ref 3.11.6).
3.14 Setting the time and date

Touch the time display box to open the time-setting menu. Click on the hours, minutes or seconds, and use the up and down arrows to change them. Then touch the “tick box” to set the new time.

Go to screen Home and touch the date button. Use the date control dialog to select the required date. Then touch the “tick box” to set the new date.
4 Operation, Echo sounder

The echosounder function measures the depth of water under the vessel.

4.1 Echo sounder Home screen (screen 0)
This screen is used to go to the desired operational screens, and for general controls.

See section 3.7 for detailed description of all screen elements. See 3.7.4 for use of the Control buttons.
4.2 Echosounder main operational screen (screen 1)

4.2.1 Screen layout

This screen is the one that is shown in normal use of the echosounder. It displays the echogram (a scrolling color-coded view of water column and seabed echoes) and depth. Speed, heading and GPS position information is indicated in the top line of the display. Image scrolling speed (minutes: seconds per division), time and draft are indicated in the second line.

The following parameters can be adjusted with this screen:
- All transceiver settings (GAIN, TVG)
- Shallow and Deep alert limits
- Range and picture speed
- Ship’s draft
- Units of measurement

![Diagram of echosounder screen with various settings and options]
4.2.2  Changing digital indicator settings

Touch the Digital Indicator area to show a control menu, which allows you to change the values that are shown. Touch the corresponding box to show a list of available selections.

**Depth reference** selections are:
- **Below transducer**: the depth shown is from the sensor to the seabed
- **Below surface**: the depth shown is from the water surface to the seabed
- **Below keel**: the depth shown is from the bottom of the ship’s keel to the seabed.

**Depth units** control the units that the depths are shown in; selections are:
- **m**: meters
- **ft**: feet
- **Fm**: fathoms

**Sensor position** control allows the position of the sensor to be shown. Selections are:
- **Fore ship**: the sensor is at the front of the ship
- **Aft ship**: the sensor is at the back of the ship

**Digit** controls the size of the text that shows the depths; selections are:
- **small**: depth is shown in a small font
- **large**: depth is shown in a large font

4.2.3  Changing depth scale

Touch and drag the echogram area to change the scale of depth that is shown in the display. Drag downwards – to reduce the range. Drag upwards – to increase the range.

Alternatively – touch the Range button and enter the digital value from the screen keyboard.

4.2.4  Changing picture advance speed

The right-to-left scroll speed can be changed by either of the following:
- Touch the scroll speed indicator to open an adjustment slider
- Touch and drag over the time scale area in the top of the echogram area

4.2.5  Setting the draft offset

The button with a picture of a ship adjusts the vessel draft offset. Touch this button, and on-screen keyboard appears. Enter the desired value and press Enter button.
A positive value is the distance between the transducer and the water surface. A negative value is the distance between the transducer and the lowest part of the keel.

### 4.2.6 Gain and TVG adjustment

Touching **Gain/TVG** button shows a set of slider controls for both. Touch and slide the appropriate slider control to increase and reduce these settings. The adjusted values are indicated on the buttons.

Increase the gain if the signal appears too weak (for example, in deep water or over very soft bottoms), and decrease it if it is too strong, and seems to be “saturating” (in shallow water and very hard bottoms).

TVG also boosts the receive signal, but the amount of gain increases with time, which helps to detect a deep seabed without increasing the level of interference from objects in the water between the boat and the seabed.

Touch the button below the slider to revert to factory settings.

### 4.2.7 Changing depth alert values

To change these values, touch one of the Alert buttons.
A digital keyboard appears on the screen; Enter the desired value in the edit line and press “Enter” button.
The value in the Alert button changes to show the new selection.

### 4.2.8 Echogram color coding

The strength of the received echo signal is color coded, when displaying in the echogram window.
4.3 Echosounder digital indicator screen (screen 2)

This screen can be used as a repeater. The large depth digits are observable from at least 5m.

The text below the numerical readout shows where the depth is measured from, and the location of the depth transducer.

Touch the Digital Indicator screen to show a control menu, which allows you to control the values that are shown. Ref 4.2.2 for details.

Ref 4.2 for details regarding all other screen elements.

Alert settings: touch Alert button to set alert limits.
4.4  Echosounder alert configuration screen (screen 3)

Note that this screen is only available with Administration privileges, ref 3.6

4.4.1  Screen layout

When a value that is measured by the system goes out of limits or failure mode occurs, an alert is issued. This screen allows setting the individual alert ID’s for different alert events, and assigns the relay (totally 2 relays) to the particular alert event.

4.4.2  Alert list

Generic alert list – ref 3.8.2

<table>
<thead>
<tr>
<th>Alert type</th>
<th>Alert ID</th>
<th>Relay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power failure alarm</td>
<td>Not used</td>
<td>1</td>
</tr>
<tr>
<td>Data from Interface Unit</td>
<td>Not used</td>
<td>Not used</td>
</tr>
<tr>
<td>No data from Sensor Unit</td>
<td>Not used</td>
<td>Not used</td>
</tr>
<tr>
<td>Shallow alarm</td>
<td>1234</td>
<td>2</td>
</tr>
<tr>
<td>Deep caution</td>
<td>Not used</td>
<td>Not used</td>
</tr>
<tr>
<td>Lost bottom caution</td>
<td>Not used</td>
<td>Not used</td>
</tr>
</tbody>
</table>

List of the alerts specific for the echosounder:

- **Shallow alarm**: Present depth value is less than the shallow alarm limit
- **Deep caution**: Present depth value is greater than the shallow alarm limit
- **Lost bottom caution**: Echosounder cannot detect bottom (for example – too deep)

Alert history (alert monitoring window)
4.4.3 Alert ID setup

Each alert event can be associated with an ID number. Such ID is used in the NMEA alarm messages, ref sections 8.5.15 and 8.5.16 for details.

To set an alert ID, touch the value box next to the alert type text. This opens a numeric touch keyboard. Enter the ID number and touch the “Return” key. Touch “Esc” to leave the value unchanged.

To reset the ID value – enter the empty string. In this case such alert type will not be presented in the output stream (ALR message).

4.4.4 Alert Relays setup

When an alert event is changing the state, it is possible to change the state of a relay in the Interface Unit, which can be used to trigger audible alarms or signal alert to other systems. Touch the “Relay Num” button next to the relevant alert type, and select the number of the relay to trigger, or “Not Used” to disable relay operation for that alert type. Ref 6.5.25 for relay connections details.

4.4.5 Scrolling freeze

A scrolling history of alerts is shown in the bottom half of the display. Freeze the monitoring window and use swipe technic – to study the alert history.

Touch the Freeze button to stop new messages being shown in the window. The button changes the shape and the scroll bar appears.

The easiest way to scroll through the alarm history is to use the swipe technique inside the monitoring window.
4.4.6 Alert depth limits setup

The shallow and deep alarm depths are shown in the Alert buttons at the bottom of the screen. If the depth is shallower than the shallow alert depth, or deeper than the deep alert depth, an alert is triggered. Touch the Alert button to change the shallow or deep alert depths. Enter the desired value from the on-screen keyboard and press enter. The new value will be indicated on the corresponding button. Note that shallow alert has alarm classification, while deep alert is just a caution.

4.4.7 Disabling audio alert

In case the audio alarms are not desirable, it is possible to disable by touching the speaker button.
4.5 **Echosounder communication screen (screen 4)**

Note that this screen is only available with Administration privileges, ref 3.6.

This screen is used to verify the incoming and outgoing data to/from the HMI unit through the system communication lines.

All data can be logged to a file on local disk and copied on the external Flash disk afterwards.

### 4.5.1 Screen layout

It is possible to enable/disable sources of the input information to be displayed in the monitoring window.

The messages in the Input window are marked by red color in case:

- Message is not recognized by EMES60 (ref 8.5.3 for details)
- Message contains wrong checksum
- Message contains illegal characters (corrupted message)

If all received messages are corrupted, this may indicate bad connection between the Interface Unit and the HMI. If only sensor messages are corrupted, this may indicate bad connection between the Sensor Unit and the Interface Unit.

One of the most probable reasons would be wrong connection of A and B nodes or bad contact in the connector.
4.5.2 Controls

Monitoring display controls: the input and output message displays can be viewed separately.

Select HMI communication port (COM1/COM2/LAN) to be displayed in the input and output monitoring windows.
Touch Input or Output button and select the port to be monitored.

Freeze: touch this to stop new messages being added to the screen. When the pause is activated, the icon changes the shape and it is possible to scroll the monitoring window by swipe upwards/downwards technique.

Save to file: touch to send the messages to a file in the HMI memory. When recordings are activated the cross will disappear from the icon. Touch the button once more – to stop data logging.

4.5.3 Recordings file name

Input and output data can be saved to separate files.
In the Communications screen, touch the “File name” box to select a name for the log file.
A file name entry box appears.

Touch the name of an existing file to select it for logging, or touch the file name entry box to open the touch keyboard to specify a new name.
The new name will appear in the list when data has been recorded to it.

To delete an existing file from the internal flash disk, touch the name to be deleted and then the button.

In order to exit the file name screen without making any changes use the button.

In order to select the file name, which is currently in the file name entry box touch the button.
Use the touch keyboard to enter the file name, and then touch the Return key to use this name, or the key to reject the entered text.
4.6 Echosounder Interface Unit setup screen (screen 5)

Note that this screen is only available with Administration privileges, ref 3.6

This screen is used to program the Interface Unit according to the specific requirements of the installation.

4.6.1 Screen layout

- **Alarm Status**: touch to display the list, Print screen: time: water temperature
- **Opto outputs**: touch to select the functions that drive the Opto output channels
- **Pulse inputs**: touch to select what happens when a pulse is received on a pulse input channel
- **Analog outputs**: touch to select the signals and range that drive the Analog output channels

Touch the baud rate area to change the setting

- **COM outputs**: check/uncheck the boxes to select the messages that are provided on the serial data output channels.

- **Screen copy**: touch to select where screen copy (print screen) is sent. Touch the printer name to select the alternative

4.6.2 Dual transducer connection
EMES60 can accommodate the second echosounder Sensor Unit, which can be connected to the NMES channel 3. If dual transducer installation is active, the baud rate of the NMEA channel 3 is automatically set to 115000 - to communicate to the sensor. Touch the vessel icon - to toggle between the Single and Double Sensor Unit installations.

Normally one of the transducers is installed in front of the vessel (Fore) and the secondary - Aft the ship.

If double transducer installation is selected, one of the Pulse inputs must be configured as the Transducer selector, ref 4.6.5. The level on this pulse input will control which sensor unit is active. If the level is low, the Fore Sensor is active. If the level is high - The Aft Sensor is active. Ref 8.2.6 for connecting the control switch.

4.6.3 Reset to default settings

The default settings of the Interface Unit can be restored to factory default values when necessary.

4.6.4 NMEA output setup

NMEA 0183 messages can be output on three serial ports; use the tick-boxes to select which messages are sent out on which serial port. Each serial port can output any number of the available messages. See section 8.4 for a description of the supported output NMEA 0183 messages.

<table>
<thead>
<tr>
<th>CH</th>
<th>1 @ 4800</th>
<th>2 @ 4800</th>
<th>3 @ 4800</th>
</tr>
</thead>
<tbody>
<tr>
<td>DPT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PDPT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DBT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>XDR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HBT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUX</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>REP</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Touch the frame with indicated baud rate value - to change the baud rate. Select one out of: 2400; 4800; 9600; 19200; 38400; 57600; 115200

The following inputs are available:
4.6.5 Pulse inputs

A signal received from an external system can be selected to cause an action in the EMES60 system. Each of two available pulse input channels can be used as:

- External dimming
- Alarm acknowledge
- Transducer selector (in case the dual transducer function is active).

Touch in the area of current setting of pulse inputs at ch1 or ch2 and select the new desired function.

Note that if both channels are set to **Dimming pulses**, ch1 will act as brightness increase and ch2 will act as brightness reduce. If only one channel is assigned to dimming function, the brightness will be changing in cycles: middle->max->middle->min-middle->max..etc.

If any of the Pulse input channels is set as **Transducer selector**, the high level on the input selects the secondary transducer as the data source (if dual transducer mode has been activated).

If **Alarm reset** is selected as the Pulse input function, the pulse on the input results in alarm acknowledge.

Ref **8.2.6** for hardware connections of the direction control voltage-free switch

Factory default value is **NOT USED**

The following outputs are available.

4.6.6 Relays

Relays are controlled from the Alerts screen ref **4.4.4**

Ref **6.5.25** for relay connections details.
4.6.7 **Opto outputs**
Factory default value is **NOT USED**

VOID
Ref 6.5.25 for connections details

4.6.8 **Analog outputs**

Analog outputs can be configured to provide a varying voltage output in response to a measured value in the EMES60 system.

Touch the first box to switch between 0 to 10 V voltage output and 4 to 20 mA current output.

The analog output can be one of:
- DBT: depth below transducer
- DBS: depth below surface
- DBK: depth below keel

Touch the next box to enter the value that corresponds to the lowest analogue output. For example, if '0.0' is entered from the touch screen keyboard, then the lowest analogue output (0V or 4mA) is given for depth of m.

Touch the next box for the highest value. For example, if '100.0' is entered, then the highest analogue output value (10V or 20mA) corresponds to depth of 100 m or greater.
Ref 6.5.25 for connections details
Factory default value is **NOT USED**

4.6.9 **Screen copy setup**

Screen copy: this controls what happens when the Print Screen button at the top of most windows is touched.

Touch **Printer** to send screen copy images to a printer, and **File** to send them to a file, stored in the HMI memory.

Touch this box to select the printer from a list of available system printers.
EMES60 is recording depth and all important navigational data during 30 days. Each day is recorded into the separate file. After 30 days of recording the oldest file will be overwritten. To change the day that is shown, touch the top-left button. All information can be replayed directly on the HMI unit, and also all history files can be downloaded to the external flash disk, see section 7.1.

The history screen window provides a graph of depth data against time. Touch at a point in the graph to show the data at that time; a vertical line appears at the selected time, and the time box in the second row down shows the selected time. The depth, important system settings and navigational data related to the selected point of time is displayed in the lower part of the screen.

Use the arrows at the bottom of the screen navigate in the record. The single arrows below the display area move the cursor left and right, and the double arrows move the entire screen left and right when it is zoomed. The depth scale can be changed by touching in the area of the range scale lines. Touching in the lower area changes the lower range. Alternatively – swiping upwards/downwards in the graph area can be used.
4.8  **Echosounder oscilloscope screen (screen 7)**

Note that this screen is only available with Administration privileges, ref 3.6

This screen is used for echosounder sensor troubleshooting and transceiver setup. The transceiver setup is only accessible in the Service mode only.

The lower part of the screen indicates the digitized echo-signal vs time, which greatly facilitates troubleshooting.

GPS information is indicated in the upper line.

Scrolling speed, in minutes and seconds per step, time, and vessel draft are indicated in the second line.
This screen shows the results of the self-test functions built into EMES60. All important parameters are collected and displayed on this screen. The status of all units is checked every 10 seconds and displayed in the monitoring window every 10 seconds. In case of abnormal operation, the data is displayed immediately and the malfunction alarm is given.

- **Self-test measurement results:**
- **Troubleshooting output log:**
  Press to freeze and scroll up/down to see more results
# Specifications

## Performance

<table>
<thead>
<tr>
<th>Echosounder</th>
<th>Speed log</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Accuracy</strong></td>
<td>0.05m or 0.5% of depth, whatever is greater</td>
</tr>
<tr>
<td><strong>Resolution digital out</strong></td>
<td>0.01m</td>
</tr>
<tr>
<td><strong>Resolution screen presentation</strong></td>
<td>Depth &lt; 100m: 0.1m Depth &gt;= 100m: 1.0m</td>
</tr>
<tr>
<td><strong>Range of measured values</strong></td>
<td>0.7m-400m</td>
</tr>
<tr>
<td><strong>Temperature Accuracy</strong></td>
<td>Temperature sensor accurate to 1°C</td>
</tr>
</tbody>
</table>

## Display Unit (separate unit for each sub-system)

- Resolution: 800x480, 7" WVGA
- Operator interface: Touch screen, tap & swipe operation
- Communication line: RS422, Optional RS232
- Day/Night modes: Full range of backlight adjustment day/night color themes selection.
- Software upgrade means: USB line, USB flash device, Ethernet
- Supported languages: English, Norwegian, German, French, Spanish, Russian, Chinese
- Calendar, clock: Real time clock support or GPS time reference.
- Environmental: IP68, front panel only
- Cutout dimensions: 137x185mm, depth 36mm
- Operating T°: -15 - +55°C (storage -20 - +60°C)
- Weight: 0.7kg
- Compass safe distance: Standard : 65 cm, Steering 40cm

## Interface Unit (separate PCB for each sub-system)

- External communication line: NMEA0183 rev4, /IEC 61162-1/3 inputs/3 outputs,
- Analog: 1 output, 10Vpp or 4-20mA, fully programmable
- Alarm relays: 2 Mechanical relays, one dedicated system power failure alarm
- General purpose input: 2 digital inputs (for synchronization, slave mode), fully programmable
- General purpose output: 2 optocoupler outputs, fully programmable
- Software upgrade means: USB line, USB flash device, Ethernet
- Environmental: IP55
- Operating T°: -15 - +60°C
- Dimensions, mm: 150x300x120
- Weight: 4kg
- Compass safe distance: Standard : 130 cm, Steering 80cm

## Echo sounder

<table>
<thead>
<tr>
<th>Speed log</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
</tr>
<tr>
<td>Presentation units</td>
</tr>
<tr>
<td>Alarms and limits</td>
</tr>
</tbody>
</table>

## Dual Sensor with Cable

- Cable length: 40m (optional 40m)
- Communication link: IEC 61162-1/2
- Environmental: IP68, 6 bar continuous immersion in water
- Operating T°: -5 - +60°C
- Sensor Dimensions: H = 124mm, D = 60.2mm
- Weight (with cable): 7kg

## Hull fitting unit (ball valve)

- Hull type: Single and double
- Body material: Stainless steel
- Pressure rating: 10 bar
- Operating T°: -5 - +60°C
- Weight: 18kg

## System Power Requirement

- Mains: Nominal 115V to 230V/103.5V to 242V, 47.5Hz to 63Hz
- DC: Nominal 24V: 21.5V to 31V
- Power: Echo sounder: 6W, speed log: 6W, HMI units: 12.8W maximum each