EML224
Operation and Installation Manual
Information

Please visit our web site www.skipper.no for additional information. Here you will find product bulletins, software updates, instruction manuals, installation procedures etc.

Important

During installation, consideration must be taken, such that the sensor and cable can be removed for service purposes. Filling pipes or tubes is **not** recommended unless strictly necessary.
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1. Introduction

System Summary
The SKIPPER EML224 is a navigational electromagnetic log system containing sensor (transducer), display (operator) unit and an electronic (interconnection) unit. The sensor can be delivered in many different versions to fit functionality demands and different hull installations. The display unit can be a larger unit with a high resolution LCD or a smaller unit with dot-matrix LEDs. This manual only cover the version with the LCD unit.

The LCD can display a number of parameter in both numerical and graphic forms. The information from the electromagnetic sensor includes longitudinal and transversal speeds, drift angle and sea temperature. It is thus possible to get a very good picture of the vessels total movements.

The EML224 electromagnetic log will give direction of speed in both axis (ahead/astern and starboard/port). This is of great importance during manoeuvring or when running at low speeds. The speed range is the same astern and ahead. The user may select display text languages as well as various units of measure. All IMO requirements are met or exceeded. Comprehensive interfaces are available including NMEA 0183 input and output.

Sensor
The sensor is an active electromagnetic unit that can be fitted into various tank or sea valve solutions. The sensor is virtually maintenance free, but occasional cleaning may be necessary depending on sea water conditions. Ordinary fouling will be limited, due to the electromagnetic field surrounding the sensor. The sensor has no moving parts and protrudes only a few millimetres outside the hull. The sensor is interfaced through an electronic unit which also contains the power supply. This unit is mounted near the hull fitting, and two twisted pairs of cable are led to the display/operator unit for digital signal transmission. The power consumption of the electronic unit is max. 35W. Voltage 115/230 V AC and/or 24 V DC.

Operator Unit
The operator unit contains a colour TFT LCD display, a keyboard with fixed keys, soft keys and a rotating encoder. The function of each soft key depends on the active screen, and the buttons are labelled on the lower rim of the LCD. The display is backlit and backlight intensity may be adjusted by the user for both day and night vision. Various user-selectable information layouts, adapted to typical operational situations, may be displayed continuously on the LCD screen. The operator unit is normally flush mounted. Operator unit power supply options are 115/230 V AC or 24V DC. The power consumption is max. 70 Watts at 115/230 V AC and/or 50 Watts at 24V DC.

Data Entry
Several screens may be selected to enter various settings and calibration parameters. Each screen has one or more soft key menus, selectable with the leftmost “MENU” soft key. Screen A and B are primary operation screens with appropriate operator controls. Screen COM, STATUS and CALIBRATION are setup and system supervision screens. The various screens will be described in detail later.
Chapter: 1. Introduction

Sea Valve
Double
Bottom

Mounting options:

115/230 V AC
24 V DC

24 V DC

Electronic Unit

Interfaces:

Repeters
Bridge systems
Alarm
Radar

VDR
Conning display
Ext. display
GPS

Accessories:

SKIPPER IR30DIM

SKIPPER IR300
or SKIPPER
CDLR Speed and
distance repeater

24 V DC

Fig. 1.1 System Overview

40 m standard
multicore cable

Sea Valve
Single
Bottom

Sea Valve
Double
Bottom

Tank

Aluminium
Tank

Aluminium
Tank

40 m standard
multicore cable

115/230 V AC
24 V DC

115/230 V AC
24 V DC
Interfacing

The EML224 has various interface possibilities.

**Outputs**

- 3 log pulse outputs 100/200/400/1000 pulses per nautical mile. See “Log Pulse Outputs” on page 37.
- 3 analogue outputs 0-10 V or 4-20 mA. See “Analogue Interfaces” on page 37.
- NMEA 0183 interface output. See “NMEA interface” on page 40 and “NMEA Setup” on page 41.
- External alarm relay output. See “Alarm Relay” on page 37.

**Inputs**

- NMEA 0183 interface input. See “NMEA Setup” on page 41.
- Remote alarm reset. See “Alarm Relay” on page 37.

**Alarms**

- High and low speed alarms may be selected from the menus. See “Fig. 2.8. Screen Status, Menu 1” on page 17.
- Input for remote alarm reset is available.

A potential free relay contact is provided in EML224 for interface to external alarm systems.

**Display Unit panel layout**

![Display Unit panel layout](image)
2. Operation

When the installation is complete, and power is connected to the operator unit, the system is switched on/off by a power switch inside the cabinet. The unit can also be switched off by pressing the SYSTEM Off softkey button on screen A and Screen B.

Note: The unit is still energized. Do not perform any connections before switching off the mains on the terminal PCB inside the cabinet.

Parameter entry

The fixed function buttons and the soft key(s) on the various screens along with the rotating encoder, facilitates entry of parameters, setpoints and other data. The following flowchart illustrates the procedure for changing settings and entering data. The various screens are shown in detail in the operation section.

Fig. 2.1 Setting and Parameter Entry Flowchart

Example of parameter entry.
Suppose you want to enter a value of 15 knots for the high speed alarm. Press a high speed alarm soft key, e.g. in screen status, menu 1, and keep it pressed while you turn the encoder until you reach 15 knots, let go of the encoder and release the high speed alarm button.
Operation Screens

Each of the operation screens contains a graphic picture and one or more menu sets configured on the 6 soft key buttons. The various screens are selected by keeping the SCREEN SELECT button pressed and rotating the encoder in either direction. Turning the encoder clockwise cycle the screens in the sequence 1 to 5, and counter clockwise rotation cycles the screens in the sequence 5 to 1. Screens A and B, covering the primary functions, may also be cycled by repeatedly pressing the SCREEN SELECT button. Screen COM, STATUS and CALIBRATION is mainly used for setup and function control, and may only be accessed by the rotating encoder.

![Diagram of operation screens]

**Fig. 2.2. Schematic overview of screens and soft key menus**
### Fig. 2.3. Screen A

<table>
<thead>
<tr>
<th>Soft key</th>
<th>Name</th>
<th>Range/value</th>
<th>Default value</th>
<th>Description</th>
<th>Activate with hidden button</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TRIP</td>
<td>Reset</td>
<td></td>
<td>Trip distance counter reset.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>SPD ALARM▲</td>
<td>0.1 - 38.9 kn</td>
<td>19.4 kn</td>
<td>High speed alarm</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>SPD ALARM▼</td>
<td>0.0 - 38.8 kn</td>
<td>0.0 kn</td>
<td>Low speed alarm</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>Not used.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>Not used.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>SYSTEM</td>
<td>On/off</td>
<td>On</td>
<td>System off.</td>
<td></td>
</tr>
</tbody>
</table>
### Table: Soft keys

<table>
<thead>
<tr>
<th>Soft key</th>
<th>Name</th>
<th>Range/value</th>
<th>Default value</th>
<th>Description</th>
<th>Activate with hidden button</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>Not used.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>Not used.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>Not used.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>Not used.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>Not used.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>SYSTEM</td>
<td>On/off</td>
<td>On</td>
<td>System off.</td>
<td></td>
</tr>
</tbody>
</table>

**Fig. 2.4. Screen B**
### Fig. 2.5 A. Screen Com, Menu 1

<table>
<thead>
<tr>
<th>Soft key</th>
<th>Name</th>
<th>Range/value</th>
<th>Default value</th>
<th>Description</th>
<th>Activate with hidden button</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MENU</td>
<td>1 - 2</td>
<td>1</td>
<td>Chosen menu number 1.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>COM</td>
<td>1 - 2, sensor</td>
<td>1</td>
<td>Serial port number referred by other keys.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>COM ERROR</td>
<td>Reset</td>
<td></td>
<td>Reset field for COM errors. The program memorizes the latest occurred NMEA input error for further analysis. By using this softkey, it is possible to reset the error.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>MESSAGE</td>
<td>VHW, VLW, VLW IEC07, VBW, MTW, ALR</td>
<td></td>
<td>NMEA message selector. Each message may be controlled individually by soft key 5.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>OUTPUT</td>
<td>On/off</td>
<td>VHW: on</td>
<td>Setting for the message in soft key 4 [On/Off]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>VLW: off</td>
<td><strong>Note:</strong> To configure the serial output of the system, go through all the messages by pressing soft key 4 and set on/off value of the soft key 5 to disable/enable a message as required.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>VLW IEC07: off</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>VBW: on</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>MTW: off</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ALR: off</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>DISPLAY</td>
<td>Input, off, output</td>
<td>Input</td>
<td>Selects the information (received from the external source or transmitted by the EML224) to be displayed in the “TEXT” window (left side).</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Input:</strong> Displays information received from external source.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Output:</strong> Displays information transmitted by EML224.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Off:</strong> None.</td>
<td></td>
</tr>
</tbody>
</table>
Fig. 2.5 B. Screen Com, Menu 1 Error/Warning messages

The right side of the screen shows the status of the available COM ports and the sensor. Showing in green which pins the ports are connected to on D-SUB type connector XJ402. Active NMEA protocols are also shown. The text window on the left side, when set to input DISPLAY, indicates what is being received and recognised by the unit.

- Accepted messages are shown in black type if the sentence is correct.
- Not of a recognised format, the text is orange.
- If something is wrong with the sentence, such as format or checksum, the text is in red.
### Fig. 2.6. Screen Com, Menu 2

<table>
<thead>
<tr>
<th>Soft key</th>
<th>Name</th>
<th>Range/value</th>
<th>Default value</th>
<th>Description</th>
<th>Activate with hidden button</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MENU</td>
<td>1 - 2</td>
<td>2</td>
<td>Chosen menu number 2.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>COM</td>
<td>1 - 2, Sensor</td>
<td>1</td>
<td>Serial port # referred by other keys.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>BAUD</td>
<td>1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200.</td>
<td>4800</td>
<td>Baud rate for COM port #n.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>DATA</td>
<td>None-7-1, Even-7-1, Odd-7-1, None-8-1, Even-8-1, Odd-8-1, None-7-2, Even-7-2, Odd-7-2, None-8-2, Even-8-2, Odd-8-2,</td>
<td>None, 1</td>
<td>Data format for COM port #n (Parity-data bits-stop bits).</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>ALARM TYPE</td>
<td>WT▼, WT▲</td>
<td>WT▼</td>
<td>Each alarm type has its own alarm ID. This button selects which alarm ID is to be viewed/changed.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>ALARM ID</td>
<td>1 - 999</td>
<td>1</td>
<td>Set the ID for the alarm selected.</td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
- BAUD and DATA appear dimmed when soft key 2 COM is in “Sensor” mode.
### Table 2.7: Screen Com, Menu 2, sensor

<table>
<thead>
<tr>
<th>Soft key</th>
<th>Name</th>
<th>Range/value</th>
<th>Default value</th>
<th>Description</th>
<th>Activate with hidden button</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MENU</td>
<td>1 - 2</td>
<td>2</td>
<td>Chosen menu number 2.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>COM</td>
<td>1 - 2, Sensor</td>
<td>Sensor</td>
<td>Serial port # referred by other keys.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>BAUD</td>
<td>1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200.</td>
<td>4800</td>
<td>Baud rate for COM port #n.</td>
<td>Yes, only when MENU 2 is selected.</td>
</tr>
<tr>
<td>4</td>
<td>DATA</td>
<td>None-7-1, Even-7-1, Odd-7-1, None-8-1, Even-8-1, Odd-8-1, None-7-2, Even-7-2, Odd-7-2, Odd-8-2, Even-8-2, Odd-8-2, None, 8, 1</td>
<td>None, 8, 1</td>
<td>Data format for COM port #n (Parity-data bits-stop bits).</td>
<td>Yes, only when MENU 2 is selected.</td>
</tr>
<tr>
<td>5</td>
<td>ALARM TYPE</td>
<td>WT▼, WT▲</td>
<td>WT▼</td>
<td>Each alarm type has its own alarm ID. This button selects which alarm ID is to be viewed/changed.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>ALARM ID</td>
<td>1 - 999</td>
<td>1</td>
<td>Set the ID for the alarm selected.</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** EML 224 Display Unit is receiving the following NMEA sentences on 4800 baud.

- $S06$ - Temperature in degrees C. (Here: +0284 equals +28.4 degrees C.)
- $S01$ - Logitudinal speed. (Here: +0019 equals 0.19 knots forward direction, uncalibrated values).
- $S02$ - Transversal speed. (Here: +0000 equals 0 knots, + = starboard, - = port, uncalibrated values)
## Screen Status, Menu 1

<table>
<thead>
<tr>
<th>Soft key</th>
<th>Name</th>
<th>Range/value</th>
<th>Default value</th>
<th>Description</th>
<th>Activate with hidden button</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MENU</td>
<td>1 - 6</td>
<td>1</td>
<td>Chosen menu number 1.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>SIMULATE</td>
<td>On/off</td>
<td>Off</td>
<td>Built-in simulator on/off.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>WT AVERAGE</td>
<td>0 - 100</td>
<td>10</td>
<td>Number of individual samples to be averaged in water track mode to provide better accuracy.</td>
<td>Yes</td>
</tr>
<tr>
<td>4</td>
<td>BUZZER</td>
<td>On/off</td>
<td>Off</td>
<td>Buzzer alarm on/off.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>SPD ALARM ▲</td>
<td>0.1 - 38.9 kn</td>
<td>19.4 kn</td>
<td>High speed alarm.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>SPD ALARM ▼</td>
<td>0.0 - 38.8 kn</td>
<td>0.0 kn</td>
<td>Low speed alarm.</td>
<td></td>
</tr>
<tr>
<td>Soft key</td>
<td>Name</td>
<td>Range/value</td>
<td>Default value</td>
<td>Description</td>
<td>Activate with hidden button</td>
</tr>
<tr>
<td>----------</td>
<td>----------</td>
<td>-------------</td>
<td>---------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>MENU</td>
<td>1 - 6</td>
<td>2</td>
<td>Chosen menu number 2.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>OUT NUM</td>
<td>1 - 3</td>
<td>1</td>
<td>Pulse output channel to be configured by soft keys 3 and 4.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>PULSES NUM</td>
<td>10, 100, 200, 400, (1000)/nm</td>
<td>400/nm</td>
<td>Number of pulses per nautical mile at this channel (key 2). Channel 1 and 2 are programmable with 10, 100, 200 and 400 pulses per nautical mile. Channel 3 are programmable with 10, 100, 200, 400 and 1000 pulses per nautical mile.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>OUT MODE</td>
<td>ResultWT, ForAftWT, LateralWT,</td>
<td>ResultWT</td>
<td>Speed parameter to be output at this channel (soft key 2).</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>Not used.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>Not used.</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** 1000 pulses per nautical mile only on Ch 3 (OUT NUM 3).
**Fig. 2.10 Screen Status, Menu 3**

<table>
<thead>
<tr>
<th>Soft key</th>
<th>Name</th>
<th>Range/value</th>
<th>Default value</th>
<th>Description</th>
<th>Activate with hidden button</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MENU</td>
<td>1- 6</td>
<td>3</td>
<td>Chosen menu number 3.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>Not used.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>YR.MONTH</td>
<td></td>
<td></td>
<td>Year and month setting.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>DAY</td>
<td></td>
<td></td>
<td>Date setting.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>HOURS</td>
<td></td>
<td></td>
<td>Hours setting.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>MINUTES</td>
<td></td>
<td></td>
<td>Minutes setting.</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** If a satellite navigator (GPS) giving UTC messages is connected to the NMEA input, the clock and calendar will be automatically updated and manual adjustment is not required.
Fig. 2.11. Screen Status, Menu 4

<table>
<thead>
<tr>
<th>Soft key</th>
<th>Name</th>
<th>Range/value</th>
<th>Default value</th>
<th>Description</th>
<th>Activate with hidden button</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MENU</td>
<td>1 - 6</td>
<td>4</td>
<td>Chosen menu number 4.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>LANGUAGE</td>
<td>English, French, Spanish, Russian, German, Scandinavian.</td>
<td>English</td>
<td>Select display language.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>VESSEL SPD</td>
<td>Knots, km/h, mi/h, m/sec.</td>
<td>Knots</td>
<td>Select speed unit.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>Not used</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>DISTANCE</td>
<td>NM, km, mi.</td>
<td>NM</td>
<td>Select distance unit.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>Not used.</td>
<td></td>
</tr>
</tbody>
</table>

Note:
- Use soft key 1 (MENU) and encoder button to get access to screen status menu 4.
### Soft key Name Range/value Default value Description Activate with hidden button

<table>
<thead>
<tr>
<th>Soft key</th>
<th>Name</th>
<th>Range/value</th>
<th>Default value</th>
<th>Description</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MENU</td>
<td>1 - 6</td>
<td>5</td>
<td>Chosen menu number 5.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>OUT NUM</td>
<td>1 - 3</td>
<td>1</td>
<td>Analogue output channel to be configured by keys 3 - 6.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>OUT MODE</td>
<td>0 - 10 V 4 - 20 mA</td>
<td>0 - 10 V</td>
<td>Output mode selection for this channel (key 2).</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>OUT MODE</td>
<td>ForArWT, Lateral/WT, ResultWT</td>
<td>ResultWT</td>
<td>Speed parameter to be output at this channel (key 2).</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>ANA MIN</td>
<td>-48.6 - 48.6 kn</td>
<td>0.0 kn</td>
<td>Speed value for minimum output at this channel (key 2).</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>ANA MAX</td>
<td>-48.6 - 48.6 kn</td>
<td>30.0 kn</td>
<td>Speed value for maximum output at this channel (key 2).</td>
<td></td>
</tr>
</tbody>
</table>
Functions described below can be used during commissioning period to test different outputs with constant, user adjustable speed values. **Note:** When the test mode (SPD TEST) is activated, this will be indicated by flashing “TEST” label in the lower left part of the screen.

<table>
<thead>
<tr>
<th>Soft key</th>
<th>Name</th>
<th>Range/value</th>
<th>Default value</th>
<th>Description</th>
<th>Activate with hidden button</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MENU</td>
<td>1 - 6</td>
<td>6</td>
<td>Chosen menu number 6.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>SPD TEST</td>
<td>On/off</td>
<td>Off</td>
<td>Toggling test mode on/off.</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>LONG. SP</td>
<td>-40.0, -20.0, -15.0, -10.0, -5.0, 0.0, 5.0, 10.0, 15.0, 20.0, 40.0, 0.0 kn</td>
<td>Select test value of longitudinal speed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>TRANSV. SP</td>
<td>-5.0, -4.0, -2.0, -1.0, -0.5, 0.0, 0.5, 1.0, 2.0, 4.0, 5.0, 0.0 kn</td>
<td>Select test value of transversal speed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>DISTANCE</td>
<td>0.00, 9.99, 99.99, 999.99, 9999.99, 99999.99, 0.00 NM</td>
<td>Select test value of distance.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Not used</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Calibration trip

<table>
<thead>
<tr>
<th>Measured distance:</th>
<th>Leg 1</th>
<th>Leg 2</th>
<th>Average Leg 1+ Leg 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.000km</td>
<td>0.000km</td>
<td>0.000km</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Real speed:</th>
<th>Leg 1</th>
<th>Leg 2</th>
<th>Average Leg 1+ Leg 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>??..??</td>
<td>??..??</td>
<td>??..??</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measured speed WT:</th>
<th>Leg 1</th>
<th>Leg 2</th>
<th>Average Leg 1+ Leg 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>??..??</td>
<td>??..??</td>
<td>??..??</td>
</tr>
</tbody>
</table>

### Calibration settings

- **Real speed WT:**
  - 1: empty
  - 2: empty
  - 3: empty
  - 4: empty
  - 5: empty

- **Measured speed WT:**
  - 1: empty
  - 2: empty
  - 3: empty
  - 4: empty
  - 5: empty

### Measured speed

<table>
<thead>
<tr>
<th>Measured speed</th>
<th>Calibrated speed</th>
<th>Averaged drift</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.9kn</td>
<td>0.0kn</td>
<td>0.0°</td>
</tr>
</tbody>
</table>

### Soft key 3 (CALIBR) available (not “dimmed”) when the calibration values are within limits.

---

**Note:**

Soft key 3 (CALIBR) available (not “dimmed”) when the calibration values are within limits.
### Calibration trip

<table>
<thead>
<tr>
<th></th>
<th>Leg 1</th>
<th>Leg 2</th>
<th>Average Leg 1+ Leg 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured distance:</td>
<td>0.000km</td>
<td>0.000km</td>
<td>0.000km</td>
</tr>
<tr>
<td>Real speed:</td>
<td>??..??</td>
<td>??..??</td>
<td>??..??</td>
</tr>
<tr>
<td>Measured speed WT:</td>
<td>??..??</td>
<td>??..??</td>
<td>??..??</td>
</tr>
</tbody>
</table>

### Calibration settings

- **Real speed WT:**
  - 1
    - 0.0kn empty
- **Measured speed WT:**
  - 2
    - empty
  - 3
    - empty
  - 4
    - empty
  - 5
    - empty

### Measured speed

- 9.3kn
- -0.3kn
- -1.9°

### Calibrated speed

- 9.3kn
- -0.3kn
- -1.9°

### Averaged drift

- -0.6°

---

**Fig. 2.15. Screen Calibration, Menu 2**

<table>
<thead>
<tr>
<th>Soft key</th>
<th>Name</th>
<th>Range/value</th>
<th>Default value</th>
<th>Description</th>
<th>Activate with hidden button</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MENU</td>
<td>1 - 3</td>
<td>2</td>
<td>Chosen menu number 2.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>CALIBR NUM</td>
<td>1 - 5</td>
<td>1</td>
<td>Number of the calibration, currently available for adjustments. In the calibration table it is marked by the frame.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>WT REAL</td>
<td>Empty, 0.0 - 38.9 kn</td>
<td>Empty</td>
<td>Real ship’s WT speed.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>WT MEASUR.</td>
<td>Empty, 0.0 - 38.9 kn</td>
<td>Empty</td>
<td>WT speed, measured by the system (not calibrated).</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>Not used.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>Not used.</td>
<td></td>
</tr>
</tbody>
</table>
### Calibration Trip

<table>
<thead>
<tr>
<th>Measured distance:</th>
<th>Leg 1</th>
<th>Leg 2</th>
<th>Average Leg 1+ Leg 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real speed:</td>
<td>???.??</td>
<td>???.??</td>
<td>???.??</td>
</tr>
<tr>
<td>Measured speed WT:</td>
<td>???.??</td>
<td>???.??</td>
<td>???.??</td>
</tr>
</tbody>
</table>

### Calibration Settings

<table>
<thead>
<tr>
<th>Real speed WT:</th>
<th>Measured speed WT:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0.0 kn</td>
<td>empty</td>
<td>empty</td>
<td>empty</td>
<td>empty</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measured speed</th>
<th>Calibrated speed</th>
<th>Averaged drift</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.7kn</td>
<td>-0.7kn</td>
<td>- 4.1°</td>
</tr>
<tr>
<td></td>
<td>9.7kn</td>
<td>- 4.1°</td>
</tr>
<tr>
<td></td>
<td>- 0.7kn</td>
<td>- 0.7°</td>
</tr>
</tbody>
</table>

### Fig. 2.16. Screen Calibration, Menu 3

<table>
<thead>
<tr>
<th>Soft key</th>
<th>Name</th>
<th>Range/value</th>
<th>Default value</th>
<th>Description</th>
<th>Activate with hidden button</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MENU</td>
<td>1 - 3</td>
<td>3</td>
<td>Chosen menu number 3.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>Not used.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>SWAP</td>
<td>No, p-s, f-a, p-s/f-a</td>
<td>No</td>
<td>Sensor 180 degrees swap.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>HEAD ERR</td>
<td>0.0 - 30.0 °</td>
<td>0.0 °</td>
<td>Installation angular error correction.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>TRANSV. ERR</td>
<td>0.0 - 38.9 kn</td>
<td>0.0 kn</td>
<td>Installation transversal error correction.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>Not used.</td>
<td></td>
</tr>
</tbody>
</table>
Principal Functions

Principles of Electromagnetic Log

The sensor of the electromagnetic log creates a magnetic field in the water. When the ship moves, the stream of water running along the hull cuts this magnetic field and generates a difference in potential between the sensor electrodes. This difference is directly proportional to the speed of the stream of water. Calibration of the log makes it possible to correct the difference between the water speed around the transducer and the speed of the ship. These differences being essentially linked to the positioning of the transducer in relation to the hull and also to the hull’s shape.

Power ON/OFF

During normal daily operation, the system may be switched off from all operation menus. This operation does not disconnect the system from the power supply, but all power consuming components are switched off. The system may be switched on again by pressing any button.

Alarm acknowledgement

When any alarm is activated, the alarm may be acknowledged by pressing any button. An alarm can also be silenced by using a remote alarm button, but the alarm message will still be present until a button is pressed on the operator unit.

Fixed Key Functions

Screen Select

The SCREEN SELECT button facilitates selection of one of the five screen and softkey layouts. The 2 primary operation screens may be cycled by repeatedly pressing the SCREEN SELECT button. Access to the remaining screens is through encoder operation. The screens are cycled in an endless, bidirectional loop, e.g. turning the encoder counter-clockwise, will open the last screen after the first screen. Turning the encoder with no buttons pressed always force screen A.

Backlight adjustment

Backlight may be continuously controlled by using the appropriate button and the encoder. Press the button and rotate the encoder until a satisfactory setting is obtained, then release the button. The settings are maintained in the nonvolatile memory, and the last settings are restored on power up. Backlight may be adjusted in both day and night vision.

Day/Night

Day/Night vision may be selected by pressing this button. See “Fig. 1.2. Display unit panel layout” on page 8.

Key Functions

Menu

On some screens, the leftmost soft key is used for selecting the desired menu, i.e. soft key layout within a screen. The different screens have a different number of menus, and some of the menu
functions may be available on more than one menu. Below is a list of some menu functions, not necessarily in the sequence they appear on the screens.

**Trip Reset**

This key is used to reset the trip distance counter. See “Fig. 2.3. Screen A” on page 11.

**Alarm Settings**

Speed alarm settings are performed from status screen, menu 1, see “Fig. 2.8. Screen Status, Menu 1” on page 17. Alarm limits are referred to the indicated speed and depth. The local alarm buzzer may be disabled from status screen, menu 1, but the external alarm relay will always operate. The only way to disable the alarms completely, is to reduce the low speed alarm to zero and increase the high speed alarm to maximum range. An active low speed alarm must be less than an active high speed alarm. Alarm limits are enforced with hysteresis.

**Alarm ID**

Both Shallow and Deep water alarms can be uniquely identified using the ID setting. This allows alarm systems to display which type of alarm sounding.

**Clock and Calendar Settings**

Manual clock and calendar adjustments are carried out in the status screen menu 3, see “Fig. 2.10 Screen Status, Menu 3” on page 19. If a satellite navigator giving UTC messages is connected to the NMEA input, the clock and calendar will be automatically updated and manual adjustment is not required.

**Simulator**

The EML224 contains a built in simulator to test the screen indicators and various interface signals. The simulator may be switched on and off on status screen menu 1, see “Fig. 2.8. Screen Status, Menu 1” on page 17. When the simulator is operating, “Demo” is flashing at the bottom of the screen.

**Status Screen**

The Status Screen shows a list of various system parameters useful for documenting system set-up and system operating status. The contents of this screen will be valuable information in situations where manufacturer support is required.

**Nonvolatile Parameter Memory**

The system contains memory to maintain installation and user parameters like language and units of measurement selection, backlight settings, etc. These parameters are automatically restored on power up. If the user parameters have never been set, default values are used.

**Options**

**Repeaters/speed and distance**

Digital repeaters may be connected to the system.
3. User Maintenance

Sensor Maintenance
The sensor is virtually maintenance free, but occasional cleaning may be necessary depending on sea water conditions.

Operator Unit Maintenance
The operator unit contains no user serviceable parts, and requires no maintenance apart from occasional cleaning of the front panel. Please use a soft cloth and no chemicals except cleaning alcohol.
4. Installation

Standard System Supply
A basic EML224 system consists of the following units:

- Display/Operator unit.
- Electronic unit.
- Sea valve with hull fitting sensor.

See “Fig. 11.1. EML224 System overview” on page 57.

Hull Fitting
Please see installation manuals (also found on our web site www.skipper.no) for chosen sea valve or tank solutions for dimensions and hull fittings.

Sensor Location
To facilitate the calibration procedure, the sensor should be installed close to the bulb or the stem of the ship, avoiding areas where it may be damaged by the anchor chain. It is necessary to select a part of the hull that is submerged under all load and speed conditions.

- The electronic unit have to be installed in a dry place.
- The sea valve with sensor can be installed in a water tank, but it is not recommended. SKIPPER will not be responsible if it is necessary to empty a tank in order to access the sensor for service purposes.
- It is necessary to position the sensor on a flat, horizontal hull section which is large enough to ensure a laminar water flow for all angles of drift.
- If such a flat section is not available, the shipyard must construct a suitable bed.
- If the vessel is designed with a box keel, this can be used for installation of the sensor. In this case, suitable hull fitting may be ordered from SKIPPER.

Before hull fitting installation procedure is initiated, always check that the sea valve can be properly operated and the sensor removed in the location selected. The required clearance to operate the valve and remove the sensor is shown in the installation manual for the sea valve solution. See Skipper web site, www.skipper.no for detailed information.

Part Positioning and Welding
Please see the installation manual for the hull fittings. Installation may differ between the different sea valve and tanks solutions available.

- **Note**: Do not paint the protruding part of the sensor and electrodes.
The Electronic Unit

The electronic unit contains the power supply PCB for the transducer. It must be installed fairly close to the hull fitting as the standard cable is 40 meters. The unit should be fitted on a vertical surface in a dry area. See “11. Appendix” on page 56 for miscellaneous installation drawings.

Sensor/Electronic Unit interconnection

- The sensor is connected to the electronic unit with the attached cable.
- The outer cable screen must be connected to the EMC cable gland. See “Fig. 11.5 Cable gland connection” on page 61.
- The EML log sensor cable can be cut or extended.

Power supply for the Electronic Unit is 115/230 V AC and/or 24V DC.

The circuit board in the electronic unit is equipped with several LEDs indicating the state of various voltages and signals. Following list show the expected status of the LEDs. Location is indicated in the wiring diagram “Fig. 4.2. Sensor /Electronic Unit, Wiring diagram.” on page 31.

<table>
<thead>
<tr>
<th>LED</th>
<th>Colour</th>
<th>Signal</th>
<th>Description/Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD100</td>
<td>Green</td>
<td>Power</td>
<td>Voltage indicator. (Flashing at 2 Hz or greater, with the field inducting current). LD100 = Sensor field generation, goes &quot;OFF&quot; when field in sensor is active.</td>
</tr>
<tr>
<td>LD200</td>
<td>Green</td>
<td>Data from sensor</td>
<td>On and flashing in accordance with data traffic. LD200 = Data received from sensor. &quot;On” connection OK. No data &quot;Off&quot; when data is received.</td>
</tr>
<tr>
<td>LD300</td>
<td>Red</td>
<td>NMEA in</td>
<td>Flashing in accordance with data traffic. LD300 = Receive NMEA messages from external systems. &quot;OFF” when message is received.</td>
</tr>
<tr>
<td>LD301</td>
<td>Green</td>
<td>NMEA out</td>
<td>Flashing in accordance with data traffic. LD301 = Transmit NMEA messages to external systems. &quot;On” when message is transmitted.</td>
</tr>
<tr>
<td>LD302</td>
<td>Green</td>
<td>Data to sensor</td>
<td>On and flashing in accordance with data traffic. LD302 = Data transmitted to sensor, &quot;ON”connection OK, no data &quot;OFF” when data is transmitted</td>
</tr>
</tbody>
</table>
Fig. 4.2. Sensor /Electronic Unit, Wiring diagram.
Operator Unit Installation

Select a position to provide free view of the panel as well as easy access during operation and service. The operator unit may be mounted flush in a panel or directly onto a bulkhead. “Fig. 11.3 Outline dimensions Display Unit” on page 59 shows the operator unit along with the main installation dimensions. If the unit is to be flush mounted, the shown cut-out and recession depth dimensions must be observed. Remember to leave room in front of the unit to open the door a full 90°.

Do not perform installation work with system power applied!!

Cables are fed through the appropriate cable glands as follows:
- The cable from the transducer should normally occupy the left gland.
- The right gland is used for power supply connection.
- Whereas the centre ones are used for any interface signals connected.

115/230 V on Combo Terminal board inside Display Unit

Power supply may be either 115 V/230 V AC and/or 24 V DC. Power consumption is appx. 50 W at 24 V, appx. 70W at 115/230 V.

If the AC power system is 115 V, EML224 may be prepared for 115 V AC by re-connecting the connectors J102, J103 as shown in “Fig. 4.3. Voltage selection connectors and fuses, Terminal Board, EML224 Operator Unit.” on page 33.

This diagram also shows position of fuses for 115/230 V AC and 24 V DC. These fuses are normal 5 x 20 mm slow blow glass fuses.

<table>
<thead>
<tr>
<th>Supply voltage</th>
<th>Fuse</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>230 V AC supply</td>
<td>FS100, FS101</td>
<td>0.5 A</td>
</tr>
<tr>
<td>115 V AC supply</td>
<td>FS100, FS101</td>
<td>1.0 A</td>
</tr>
<tr>
<td>24 V DC supply</td>
<td>FS102</td>
<td>3.15 A</td>
</tr>
</tbody>
</table>

When the installation is complete, and power is connected to the operator unit, the appropriate power switch by the power terminals is switched on. For daily operation, these switches may stay on and the unit is switched off by pressing the “SYSTEM off” button on screen A or screen B. The unit is switched on by pressing any button.

Both 115/230 V AC and 24 V DC power may be connected and switched on at the same time. If one of these supplies shuts down, changeover is automatic.
Fig. 4.3. Voltage selection connectors and fuses, Terminal Board, EML224 Operator Unit.
After installation is complete and system power is applied, it is necessary to connect the battery to provide power to the circuitry containing user parameters at a system power failure. Refer to Fig. 4.4 above for the correct setting of the battery jumper “ON” position 2-3. This jumper should be set to the “OFF” position 1-2 only during extended unit storage periods. The battery is active only when no power is applied to the power terminals.

**Back-up Battery Jumper JP200**

Fig. 4.4. Back-up Battery Jumper, I/O Board.
Power indication and function LEDs

The following LEDs are located on the terminal board:

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD400</td>
<td>NMEA signal activity on receive input 1.</td>
</tr>
<tr>
<td>LD401</td>
<td>NMEA signal activity on receive input 2.</td>
</tr>
<tr>
<td>LD700</td>
<td>+5 V#1/VCC (Board external and CPU).</td>
</tr>
<tr>
<td>LD701</td>
<td>+12 V#1/VDD (Board external).</td>
</tr>
<tr>
<td>LD702</td>
<td>+5 V#2 (Board internal).</td>
</tr>
<tr>
<td>LD703</td>
<td>+12 V#2 (Board internal).</td>
</tr>
<tr>
<td>LD704</td>
<td>-12 V.</td>
</tr>
<tr>
<td>LD705</td>
<td>-5 V.</td>
</tr>
</tbody>
</table>

Fig. 4.5. Function LEDs, Terminal Board.
Interfacing.

Fig. 4.6. Input/Output Circuitry.
Interfacing

Alarm Relay

An alarm relay is provided for interconnection to external alarm systems. This relay is normally energized, and is released by alarm conditions or power failure/power off. See “Fig. 4.7. Alarm interconnection” on page 38 and “Fig. 11.2. Terminal board connections” on page 58. The terminals have the following significance:

<table>
<thead>
<tr>
<th>Name</th>
<th>J100 pin no</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALCOM</td>
<td>3</td>
<td>Common terminal.</td>
</tr>
<tr>
<td>ALNO</td>
<td>4</td>
<td>Normally open contact.</td>
</tr>
<tr>
<td>ALNC</td>
<td>5</td>
<td>Normally closed contact (Normal = “No alarm” condition).</td>
</tr>
<tr>
<td>INHIBREF</td>
<td>9</td>
<td>Reference for remote alarm reset.</td>
</tr>
<tr>
<td>INHIB2</td>
<td>11</td>
<td>Remote alarm reset.</td>
</tr>
</tbody>
</table>

Log Pulse Outputs

Pulse output terminals are as follows:

- Each group of pulse outputs are galvanically separated. All pulse outputs are opto coupled.
- The opto couplers may be used for any pulse rate.
- The pulse rates and velocity vectors to output are programmable in “Fig. 2.9. Screen Status, Menu 2” on page 18.
- Possible settings are 10/100/200/400/1000 (1000 on Ch 3 only, OUT NUM 3).

<table>
<thead>
<tr>
<th>Name</th>
<th>J100 pin no</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPT3DC</td>
<td>21</td>
<td>Optocoupler 3, direction collector.</td>
</tr>
<tr>
<td>OPT3VC</td>
<td>20</td>
<td>Optocoupler 3, velocity collector.</td>
</tr>
<tr>
<td>OPT3EE</td>
<td>19</td>
<td>Optocoupler 3, common emitters.</td>
</tr>
<tr>
<td>OPT2DC</td>
<td>18</td>
<td>Optocoupler 2, direction collector.</td>
</tr>
<tr>
<td>OPT2VC</td>
<td>17</td>
<td>Optocoupler 2, velocity collector.</td>
</tr>
<tr>
<td>OPT2EE</td>
<td>16</td>
<td>Optocoupler 2, common emitters.</td>
</tr>
<tr>
<td>OPTVE</td>
<td>15</td>
<td>Optocoupler 1, velocity emitter.</td>
</tr>
<tr>
<td>OPTVC</td>
<td>14</td>
<td>Optocoupler 1, velocity collector.</td>
</tr>
</tbody>
</table>

Opto coupler direction output, Transistor Off = AHEAD or STARBOARD.

Analogue Interfaces

EML224 is equipped with 3 analogue outputs to supply analogue repeaters or other equipment with analogue inputs. The signals are galvanically connected to the EML224. Standard range is 0 - 10 V or 4 - 20 mA. The velocity vectors and output modes are programmable from status screen, menu 5, see “Fig. 2.12. Screen Status, Menu 5” on page 21.

<table>
<thead>
<tr>
<th>Name</th>
<th>J100 pin no</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANAOUTREF</td>
<td>22</td>
<td>System ground, common negative reference for analogue outputs.</td>
</tr>
<tr>
<td>ANAOUT1</td>
<td>23</td>
<td>Analogue output #1.</td>
</tr>
<tr>
<td>ANAOUT2</td>
<td>24</td>
<td>Analogue output #2.</td>
</tr>
<tr>
<td>ANAOUT3</td>
<td>25</td>
<td>Analogue output #3.</td>
</tr>
</tbody>
</table>
All Digital Inputs INPUTx
Inputs are NOT galvanically separated.
Observe caution.

All Pulse Outputs PULOxV(D)C/E
Optocoupler Outputs:
Max 30 V
Max 150 mA

Analogue Outputs are programmable:
0 - 10V (min R = 470Ω) or 4 - 20 mA (max R = 470Ω)

Note: Power failure alarm not implemented on EML 254.

Fig. 4.7. Alarm interconnection
Fig. 4.8. Misc IO examples
**NMEA interface**

The NMEA outputs provide NMEA 0183 format speed information for other equipment with NMEA 0183 inputs. Standard COM settings is 4800 baud, 8 bit, no parity. Several messages may be selected on COM Screen and the enabled messages are transmitted every second. See “Fig. 2.5 A. Screen Com, Menu 1” on page 13 and “Fig. 2.6. Screen Com, Menu 2” on page 15.

The NMEA inputs accept position, heading and UTC time messages from various talkers. The two inputs provided may be connected to different talkers, and both data streams will be received. There are two outputs that each will drive up to 10 standard NMEA 0183 listeners.

See “NMEA Setup” on page 41 for a complete list of transmitted and received messages.

Also see “Fig. 5.1 9 Pin D-Type NMEA connector XJ402 in cabinet front” on page 42 for pin connections.

**Options**

**Repeaters**

- Analogue or digital speed and distance repeaters may be connected.
- SKIPPER IR300 speed, and/or SKIPPER CDLR distance repeater may also be connected.
- Interface NMEA 0183.

**External Interface Ports**

![Fig. 4.9 External Interface Ports](image-url)
Chapter: 5. Start-up and system adaption

Analogue Outputs and Log Pulse Outputs Range Selection

From “Fig. 2.9. Screen Status, Menu 2” on page 18 it is possible to set number of pulses per nautical mile (p.p.n.m.) for the 3 available contact closure output channels (Ch):

<table>
<thead>
<tr>
<th>Channel number</th>
<th>Pulses per nautical mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10, 100, 200 or 400.</td>
</tr>
<tr>
<td>2</td>
<td>10, 100, 200 or 400.</td>
</tr>
<tr>
<td>3</td>
<td>10, 100, 200, 400 or 1000.</td>
</tr>
</tbody>
</table>

(The selected value for each output is shown in status screen).

Minimum and max limits for the analogue outputs may be set to:

- Maximum speed: -48/+48 knots corresponding to 10 V or 20 mA.
- Minimum speed: -48/+48 knots corresponding to 0 V or 4 mA.

Language and Units of Measure

From status screen “Fig. 2.11. Screen Status, Menu 4” on page 20 it is possible to select different languages and units of measure for the screen and printer character strings.

The available languages are:

- English, French, Spanish, Russian, German and Norwegian.

Units of measure may be selected for:

- Vessel speed: knots, km/h, miles/h, m/s.
- Distance: nm, km, miles.

NMEA Setup

Com screen is used for verification of received and control of transmitted NMEA messages. The baud rate may be set to 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200, 4800 being the more common. When a NMEA talker is connected to one of the EML224 inputs, all received messages will be displayed on the screen. If no messages are displayed, check the signal polarity and the baud rate. The following messages are accepted for input to EML224 and interpreted by the program. The talker identifier is ignored:

<table>
<thead>
<tr>
<th>Time</th>
<th>Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universal Time</td>
<td>ZZU,xxxxxx</td>
</tr>
<tr>
<td>Universal Time &amp; Local</td>
<td>ZLZ,xxxxxx,xxxxxx,-xx</td>
</tr>
<tr>
<td>Day, Month, Year</td>
<td>ZDA,xxxxxx,xx,xx,xxxx,-xx</td>
</tr>
</tbody>
</table>

The time values will be indicated in the upper left corner of the screen, example: 11:43.
### Position

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Geographical Lat/Lon</td>
<td>GLL,xxxx.xx,N,xxxx.xx,W</td>
</tr>
<tr>
<td>Geographical Fix, present</td>
<td>GXP,xxxxxx,xxxx.xx,N,xxxx.xx,W,cccc,x</td>
</tr>
<tr>
<td>Omega Fix, present</td>
<td>GOP,xxxxxx,xxxx.xx,N,xxxx.xx,W,cccc</td>
</tr>
<tr>
<td>Loran C Fix, present</td>
<td>GLP,xxxxxx,xxxx.xx,N,xxxx.xx,W,cccc</td>
</tr>
<tr>
<td>GPS Position</td>
<td>GGA,xxxxxx,xxxx.xx,N,xxxx.xx,W,x</td>
</tr>
</tbody>
</table>

The position values will be indicated on top of the screen, right side, example: E059° 13.12’ N010° 57.34’

### Heading

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Heading, true, present</td>
<td>HDT,xxx.,T</td>
</tr>
<tr>
<td>Heading, magnetic, present</td>
<td>HDM,xxx.,M</td>
</tr>
<tr>
<td>True heading and status</td>
<td>THS,x.x,a*hh&lt;CR&gt;&lt;LF&gt;</td>
</tr>
<tr>
<td>Heading, compass</td>
<td>HCC,xxx.</td>
</tr>
</tbody>
</table>

The heading values will be indicated on top of the screen, right side, example: 123.0°.

### Composite

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Loran C specific</td>
<td>RMA,a,xxxx.xx,N,xxxx.xx,W,xxxx.x,xxx.,*xx</td>
</tr>
<tr>
<td>GPS, Transit specific</td>
<td>RMC,xxxxxx,a,xxxx.xx,N,xxxxx.xx,W,xx.x,xxx.,xxxxxx,,*xx</td>
</tr>
<tr>
<td>Vessel Identification</td>
<td>IMA,aaaaaaaaaaaaaaa,xxxxxx,xxxxxx,xxxx.xx,N,xxxxxx.xx,W,xxxx.x,T,xx.x,M,xx.x,N</td>
</tr>
</tbody>
</table>

The composite values will be indicated on different positions on top of the screen, depending on message type.

### EML224 transmitted (originated) NMEA 0183 messages

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>VHW</td>
<td>Boat Speed and Heading</td>
<td>$VDVHW,xxxx.x,N,x.x,K*hh&lt;CR&gt;&lt;LF&gt;</td>
</tr>
<tr>
<td>VLW</td>
<td>Distance Travelled through the water</td>
<td>$VDVLW,xxxx.x,N,x.x,N*hh&lt;CR&gt;&lt;LF&gt;</td>
</tr>
<tr>
<td>VLW IEC07</td>
<td>Dual ground/water distance</td>
<td>$VDVLW,xxxx.x,N,x.x,N,x.x,N,N*hh&lt;CR&gt;&lt;LF&gt;</td>
</tr>
<tr>
<td>VBW</td>
<td>Dual ground/water speed</td>
<td>$VDVBW,xxxx.x,A,x.x,A,x.x,A*hh&lt;CR&gt;&lt;LF&gt;</td>
</tr>
<tr>
<td>MTW</td>
<td>Temperature</td>
<td>$VDMTW,x.x,C,*hh&lt;CR&gt;&lt;LF&gt;</td>
</tr>
<tr>
<td>ALR</td>
<td>Set alarm state</td>
<td>$VDALR,hhmmss.xx,A,A,&lt;Alarm message&gt;*hh&lt;CR&gt;&lt;LF&gt;</td>
</tr>
</tbody>
</table>

All data fields are free format. Values will be preceeded with sign as needed ( e.g “-” = Astern, Port) *hh = Checksum

Note: Connector seen from outside.
6. Calibration procedure

Speed logs are calibrated in the factory to give reasonable results after installation, however installation and hydrodynamics vary from vessel to vessel. It is therefore necessary to calibrate speed logs once in place.

SKIPPER speed logs have two parameters that need to be corrected by calibration.

1. Angular sensor installation error (heading error).
2. Speed variations due to drag or mounting tilt.

1. **Heading Error**

   Mounting error (heading error)

   ![Diagram](image)

   The heading error parameter corrects for an angular offset in mounting. This offset will result in a rotation of the measurement axes. The resultant speed will be unaffected, but the longitudinal and transversal components will be incorrect. An offset will result in the vessel typically showing too much transversal speed, but may also result in speed calibration failing (i.e. initial calibration fails when further points are added). This offset will show itself as an averaged drift on the calibration.

   **Reducing Heading errors.** New generation sea valves can be manually adjusted to ensure the sensor is correctly aligned. Alignment and heading offset are directly connected. To minimalise the offset, the sensor should be mounted pointing ahead

   - **Tank mountings** have ahead marks on both the tank and the sensor insert.
   - **Sea valves** have either a mark on the top flange (DL850 540 retro fit system) or a flat mark on the port side of the pole which when a flat object is placed against this, will point fore/aft (Figure 6.1).

![Image of flat object and sea valve alignment](image)

**Fig. 6.1 Sea valve alignment**

The flat side should be on the port side.
2. **Speed variations** due to drag or mounting tilt.

Every vessel will drag some water when it moves. This occurs over the whole hull. As you move further from the hull, the effect of the ship's movement gets less. As the vessel moves at different speeds, the hydrodynamics of the vessel may change. In most cases the drag is even over the whole range of the vessel.

Speed logs that measure on the surface of the vessel (such as EML) are more affected by this factor than sensors that measure remotely (Doppler). The calibration variation is usually less on remote sensors.

As the calibration factors can vary at different vessel speeds, it is possible to calibrate at several speeds. It is typically necessary with only one high and one low speed. Speed logs with speed over ground can be compared with GPS speed over ground in stable conditions. However, speed through water measures the influence of currents on the vessel, which cannot normally be measured on any other system. It is therefore important that full calibration is performed at least once for speed through water.

**Calibration routine:**

As previously explained, there are two factors to be calibrated, heading error and speed variations. Speed through water can be approximated, but should be calibrated by sailing on opposite courses to get an accurate value.

All calibration functions are located on the **Calibration** screen. In order to select this screen, press “screen select” button in the lower row of the panel buttons and while keeping it pressed, turn encoder until desired screen appears on the display.

**Activation of the hidden menus**

To avoid accidental access to the internal settings, all calibration functions are disabled during normal operation. In order to activate them, do the following:

- Open front door of the cabinet and find a “hidden” key on the component side of the keyboard PCB (upper/left corner of the PCB).
- Press key mentioned above and keep it pressed for 2-3 seconds, until “Calibration enabled” message is observed in the right/upper corner of the screen. The text on the START soft key will change colour from grey to white, which indicates availability of the corresponding functions.

**Note:** After calibration is finished, disable access to the calibration functions simply by pressing the key again. Calibration mode is also disabled after a power recycling.
Step 1. Heading error correction:
The vessel sails a steady course in calm waters and the user reads the resultant angle (averaged drift). This is entered into the system using the Head err button and encoder on menu 3, and adjusted until the averaged drift angle is zero.

Step 2a. Manual speed calibration/adjustment:
The user enters speed values directly into the calibration table by comparing to other equipment, such as GPS. This can also be used to adjust values. Menu 2 allows you to enter the values directly. Press and hold an empty button will take the current values and place them in the table.

Screen calibration showing manual adjustment.
Placing values in the WT (Water Track) is not accurate, as it does not take water currents into account. (Step 2b is recommended).
**Step 2b. Semi Automatic calibration:**

The vessel is made to sail a known distance and course in both directions, this to remove any water current factors from the speeds.

![Diagram showing 1st and 2nd leg](image)

The 1st leg will show a different speed to the 2nd leg, however the direction changes in the second leg so that the average is correct.

The speed can be calibrated as follows:

1. Assuming you have performed step 1 “Heading Error”, plot a known distance on the chart. Enter this value into the Calibration on menu 1.

![Figure shows plotting a calibration path on the chart.](image)

The leg should take at least 5 minutes to sail (distance can be shorter when sailing slowly).

**Calibration**

A measured speed 30-50 % lower than real speed is normal on EML. This is due to measurement close to the hull and the hull is “dragging” water. You may have only 1 calibration setting. If this calibration setting is correct and is making a calibration curve valid for all speeds, you do not need any more calibration settings.

Normally we advice to have 2 calibration settings.

- One in low speed
- One in high speed

When this calibration is done, you may check if speed is correct in all speeds. If you have a speed area where speed is different from actual speed, you may make an additional calibration setting in this area.

**Please note!**

Only one calibration setting in each speed area. If one calibration setting is wrong, you should correct it and not make an additional calibration setting in the same speed area.
1. Sail at a straight course in direction A to B and at a constant speed. When passing to point A, Press "START leg 1" on menu 1. The button text will change to stop and a calibrating warning will show on the screen.

2. The leg 1 measured distance will count up. You may ignore this. When you reach point B, press STOP. The system will then calculate the measured speed (from the measured distance and time) and the real speed (from the Calibr distance and time).

3. Turn the vessel and repeat for leg 2 in the opposite direction at the same speed. The results will show in the Leg 2 table. The average of the two legs will show in the final table. This is the correct calibration.

4. If the calibration looks correct, you may select which calibration settings table to place it in, and transfer using the activate calibration button (which will be active if the calibration is within limits).

5. You have now made a calibration point. We recommend a point at low speed (1-3 kn) and one at max speed (20 kn).

6. Once calibrated, check the system at other speeds. If it is inaccurate, you may add more points (max 5).

NOTE: These values may be overwritten in some software upgrades or if master reset is performed. We advise recording the values somewhere, just in case. EML systems typically have a calibration factor of up to 50% i.e. measured 5 kn, real 10 kn, depending on mounting position and hull design.
7. Specifications

Dimensions

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Cable length</th>
<th>40 m.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting</td>
<td>Sea valve or tank.</td>
<td></td>
</tr>
<tr>
<td>Electronic Unit</td>
<td>H x W x L</td>
<td>120 x 300 x300 mm.</td>
</tr>
<tr>
<td></td>
<td>Weight</td>
<td>ca. 6 kg.</td>
</tr>
<tr>
<td>Operator unit cabinet</td>
<td>Height, front</td>
<td>340 mm.</td>
</tr>
<tr>
<td></td>
<td>Width</td>
<td>320 mm.</td>
</tr>
<tr>
<td></td>
<td>Depth</td>
<td>170 mm.</td>
</tr>
<tr>
<td></td>
<td>Weight</td>
<td>ca. 10 kg.</td>
</tr>
<tr>
<td>Operator Unit Cabinet</td>
<td>H x W</td>
<td>322 x 302 mm.</td>
</tr>
<tr>
<td></td>
<td>Corner radius</td>
<td>4 mm</td>
</tr>
</tbody>
</table>

Functional Properties

<table>
<thead>
<tr>
<th>Display</th>
<th>10.4” 158 x 211 mm TFT LCD, 640 x 480 pixels.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed alarms</td>
<td>High and low limits.</td>
</tr>
<tr>
<td>Calendar/clock</td>
<td>Year-Month-Day / Hours-Minutes (24 hour system).</td>
</tr>
<tr>
<td>Interface outputs</td>
<td>Pulses for speed.</td>
</tr>
<tr>
<td></td>
<td>Analogue 4 - 20 mA and 0 - 10 V for speed.</td>
</tr>
<tr>
<td></td>
<td>NMEA 0183.</td>
</tr>
<tr>
<td></td>
<td>Alarm relay.</td>
</tr>
<tr>
<td></td>
<td>VGA output for external monitor.</td>
</tr>
<tr>
<td>Interface inputs</td>
<td>NMEA 0183 for position, heading and time.</td>
</tr>
<tr>
<td>Languages</td>
<td>English, French, Spanish, Russian, German and Norwegian.</td>
</tr>
<tr>
<td>Options</td>
<td>Digital speed and distance repeater.</td>
</tr>
</tbody>
</table>

Performance

<table>
<thead>
<tr>
<th>Trip counter</th>
<th>Measurement from 0 to 99 999.99 nautical miles.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance accuracy</td>
<td>0.2 nm or 2 % whichever is greater.</td>
</tr>
<tr>
<td>Speed accuracy</td>
<td>0.2 Kn or 2 % whichever is greater.</td>
</tr>
<tr>
<td>Speed range</td>
<td>+/- 40 Kn.</td>
</tr>
<tr>
<td>Rolling</td>
<td>More than +/- 10 degrees.</td>
</tr>
<tr>
<td>Pitching</td>
<td>More than +/- 5 degrees.</td>
</tr>
<tr>
<td>Digital resolution</td>
<td>0.1 knots.</td>
</tr>
</tbody>
</table>

The performance will depend on turbulence, aeration and sea conditions. These effects may lead to occasional incorrect indication of speed and distance. Speed measurement is done directly on the sensor surface, comply with IMO Res. A.824/A1.1
Environmental according to IEC60945

<table>
<thead>
<tr>
<th>Operator/Display Unit</th>
<th>AC Supply voltage</th>
<th>230 V (195 - 253 V AC) or 115 V (96 - 125 V AC).</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DC supply voltage</td>
<td>24 V DC (20-32 V).</td>
</tr>
<tr>
<td></td>
<td>Power consumption</td>
<td>50 W at 24 V, 70 W at 230 V or 115 V.</td>
</tr>
<tr>
<td></td>
<td>Alarm relay</td>
<td>Change-over contact, max. 24 V 300 mA.</td>
</tr>
<tr>
<td></td>
<td>NMEA port</td>
<td>9 pin D-type. 2 inputs, 2 outputs.</td>
</tr>
<tr>
<td></td>
<td>Operating temperature</td>
<td>-15 - 55 degree C. To increase serviceability and lifetime, we suggest the working temperature to be held at 0 - 40 degrees C.</td>
</tr>
<tr>
<td></td>
<td>Storage temperature</td>
<td>-20 - 70 degree C.</td>
</tr>
<tr>
<td></td>
<td>Humidity</td>
<td>10 - 90 % relative, no condensation.</td>
</tr>
<tr>
<td></td>
<td>Protection</td>
<td>IP 23.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electronic Unit</th>
<th>AC Supply voltage</th>
<th>230 V (195 - 253 V AC) or 115 V (96 - 125 V AC).</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DC supply voltage</td>
<td>24V DC (20-32 V).</td>
</tr>
<tr>
<td></td>
<td>Operating temperature</td>
<td>-15 - 55 degree C. To increase serviceability and lifetime, we suggest the working temperature to be held at 0 - 40 degrees C.</td>
</tr>
<tr>
<td></td>
<td>Storage temperature</td>
<td>-20 - 70 degree C.</td>
</tr>
<tr>
<td></td>
<td>Protection</td>
<td>IP33.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transducer (sensor)</th>
<th>Operating temperature</th>
<th>-15 - 55 degree C.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Storage temperature</td>
<td>-20 - 70 degree C.</td>
</tr>
<tr>
<td></td>
<td>Protection</td>
<td>Submerged, 6 bar.</td>
</tr>
</tbody>
</table>
# 8. Trouble Shooting

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic System Integrity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• No picture on LCD screen.</td>
<td>1. No AC or DC power to the system.</td>
<td>1. Check switches and fuses on the terminal board inside the EML224 cabinet.</td>
</tr>
<tr>
<td></td>
<td>2. System is in standby mode.</td>
<td>2. Press any button on the panel.</td>
</tr>
<tr>
<td></td>
<td>3. Defective LCD module.</td>
<td>3. Replace LCD module.</td>
</tr>
<tr>
<td></td>
<td>4. Voltage(s) out of range.</td>
<td>4. Replace terminal PCB.</td>
</tr>
<tr>
<td>• Picture is difficult to read.</td>
<td>1. Backlight is too weak.</td>
<td>1. Increase backlight settings.</td>
</tr>
<tr>
<td>• Display backlight malfunctions.</td>
<td>1. Error during initialization.</td>
<td>1. Turn off power and wait for 5 sec. before restart.</td>
</tr>
<tr>
<td>• Display picture is hardly visible.</td>
<td>2. Defective backlight tubes.</td>
<td>2. Replace backlight tubes.</td>
</tr>
<tr>
<td>• Rotary encoder malfunctions.</td>
<td>3. Defective backlight power inverter.</td>
<td>3. Replace inverter PCB.</td>
</tr>
<tr>
<td>• Panel buttons malfunctions.</td>
<td>1. Defective Encoder or interface.</td>
<td>1. Replace keyboard PCB.</td>
</tr>
<tr>
<td></td>
<td>2. SW problem.</td>
<td>2. Recycle power.</td>
</tr>
<tr>
<td>• Loose user setup and calibration data.</td>
<td>1. Battery backup not enabled.</td>
<td>1. See “Fig. 4.4. Back-up Battery Jumper, I/O Board.” on page 34.</td>
</tr>
<tr>
<td></td>
<td>2. Battery empty.</td>
<td>2. Replace battery or I/O board.</td>
</tr>
<tr>
<td>• Ambient t in status screen shows too high.</td>
<td>1. Obstructed air flow.</td>
<td>1. Check installations for obstructions of vent holes.</td>
</tr>
<tr>
<td></td>
<td>2. Defective fan.</td>
<td>2. Replace fan.</td>
</tr>
<tr>
<td>• Wrong main voltages, (Acceptable range)</td>
<td>1. Defective power supply.</td>
<td>1. Replace terminal PCB.</td>
</tr>
<tr>
<td>• +5V CPU: (4.7 V - 5.3 V)</td>
<td>2. CPU or I/O PCB problem.</td>
<td>2. Replace CPU or I/O PCB.</td>
</tr>
<tr>
<td>• +5V IO: (4.7 V - 5.3 V)</td>
<td>3. Terminal PCB problem.</td>
<td>3. Replace terminal PCB.</td>
</tr>
<tr>
<td>• +12V CPU: (11.3 V - 12.7 V)</td>
<td>4. CPU problem.</td>
<td>4. Replace CPU.</td>
</tr>
<tr>
<td>• +12V IO: (11.3 V - 12.7 V)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Installation problems

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen COM RX status shows: No signal. In Electronic Unit: LD100 is not active.</td>
<td>1. Electronic Unit power is off. 2. Incorrect supply voltage.</td>
<td>1. Switch on the power of the transceiver unit or check fuses. 2. Check supply voltage.</td>
</tr>
<tr>
<td>Screen COM RX status shows: No signal. In Electronic Unit: LD100 is active, LD200 is not active.</td>
<td>1. No power to sensor. 2. Bad connection of the sensor cable. 3. Defective sensor or cable.</td>
<td>1. Check voltage terminal 1 and 2 on J200. Should be 24V. 2. Check if the sensor is connected on the Electronic Unit terminal according to wiring diagram. See “Fig. 4.2. Sensor /Electronic Unit, Wiring diagram.” on page 31. 3. Test/replace sensor.</td>
</tr>
<tr>
<td>Screen COM RX status shows: No signal. In Electronic Unit: LD100 is active, LD200 is active.</td>
<td>1. No data from sensor. 2. Com port locking due to “fiddling work” on serial lines.</td>
<td>1. Sensor must be reconfigured or replaced. 2. Recycle power.</td>
</tr>
<tr>
<td>Screen COM RX status shows: Data error.</td>
<td>1. Wrong polarity on serial line from sensor. 2. Wrong polarity on serial line between Electronic Unit and display unit. 3. Damaged communication cable.</td>
<td>1. Check connection and polarity of the serial lines. 2. Check connection and polarity of the serial lines. See “Fig. 4.2. Sensor /Electronic Unit, Wiring diagram.” on page 31. 3. Test/replace cable.</td>
</tr>
</tbody>
</table>

## Interface problems

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>NMEA input signals are not listed in the NMEA input screen.</td>
<td>1. Wrong polarity of input signals.</td>
<td>1. Swap NMEA 0183 input lines.</td>
</tr>
<tr>
<td>NMEA input signals are listed in the NMEA input screen, but not accepted by the EML.</td>
<td>1. Error during initialization. 2. Irregular message mnemonic.</td>
<td>1. Cycle power of operator unit after NMEA Connection is established. 2. Check remote (talker) setup.</td>
</tr>
<tr>
<td>NMEA output signals are not accepted by the remote system.</td>
<td>1. Remote (listener) setup.</td>
<td>1. Verify correct remote (listener) setup.</td>
</tr>
<tr>
<td>Analogue output malfunctions.</td>
<td>1. Incorrect range settings.</td>
<td>1. Verify upper and lower limits in status screen. See “Fig. 2.12. Screen Status, Menu 5” on page 21.</td>
</tr>
<tr>
<td>Pulse output malfunctions.</td>
<td>1. Incorrect pulse frequency settings.</td>
<td>1. Verify pulse settings in status screen. See “Fig. 2.9. Screen Status, Menu 2” on page 18.</td>
</tr>
<tr>
<td>Alarm output do not work.</td>
<td>1. Incorrect terminal. 2. Defective output.</td>
<td>1. Check use of AL NC and AL NO terminals. See “Fig. 11.2. Terminal board connections” on page 58. 2. Replace terminal PCB.</td>
</tr>
</tbody>
</table>

## Basic functionality

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constantly wrong speeds or no speed.</td>
<td>1. Wrong calibration. 2. Growth on sensor. 3. Damaged sensor.</td>
<td>1. Check calibration/recalibrate. 2. Clean sensor. 3. Replace sensor.</td>
</tr>
</tbody>
</table>
Typical Status Screen Contents

The status screen contain information that will facilitate analysis and correction of several problems. Information from the status screen should be sent by fax/E-mail with any report about functional disturbances. This will greatly facilitate remote failure analysis. If it is possible to cycle through the screens and observe this information, several assumptions may be made regarding operation of the EML224 system. Although some of the subsystems necessary for this basic system operation may still suffer from minor or intermittent operation disorders, the fact that it is possible to select and observe this screen, indicate correct operation of the following EML224 subsystems:

- The CPU board is operating.
- The keyboard and backlight PCBs are working.
- The keyboard interface part of the I/O board is working.
- The power supplies on the terminal board are basically working.

The other information on the status screen is a collection of information which may be observed and manipulated with the various screen soft key selections. As a reference, it will often be more convenient to observe the various settings together on this screen than to cycle from screen to screen to check on the soft key texts.

Fig. 8.1 Typical contents of status screen
9. CPU Board Setup Procedure

- Connect a PC keyboard and a VGA screen to the CPU board.
- Switch “On” the unit while pressing “Delete” key on the PC keyboard.
- Do not release the “Delete” key before the “Setup” picture is present on the screen.

CPU PCA 6742VE

(Bios version 1.12). The PCA 6742 has the default settings with the following changes. Start by loading the optimized defaults, and then change the following:

STANDARD CMOS FEATURES
Date: Change to today's date
Time: Change to time now
Halt on: No errors

Advanced BIOS Features
   i. 1 should be ch.1 M.
   ii. 2 should be ch 0 M.
b. First Boot Device [Hard Disk]
c. Second Boot Device [Hard Disk]
d. Boot other device [Disabled]

Advanced Chipset features
a. SMI712 VGA Settings [Press Enter] – Press enter
   i. SMI712 VGA Monitor [Simul monitor]
   ii. Panel resolution Mode [640x480 TFT]
b. USB Device Setting [Press Enter] – press enter
   i. USB1.0 emulation [Disabled]

Integral Peripherals
a. Onboard serial Port 3 [enter]
   i. Change to [2E8/IRQ9]
b. Onboard serial Port 4 [enter]
   i. Change to [3E8/IRQ5]
c. Parallel Port Mode [EPP]
d. EPP Mode Select [EPP1.9]

PnP/PCI Configurations
a. Resources Controlled By [Manual]
b. IRQ Resources [Enter]
   i. IRQ – 7 assigned to [Legacy ISA]
   ii. IRQ – 10 assigned to [Legacy ISA]
   iii. IRQ – 11 assigned to [Legacy ISA]
c. NO DMA

PC Health Status
a. Case Open Warning [Disabled]

SAVE SETTINGS AND EXIT
**Master Reset Procedure**

After completed setup procedure, you should always do a “MASTER RESET”.

- Switch off the EML224, using the internal toggle switch(es) and wait a few seconds.
- Then press down and keep pressed the soft key to the far left and far right (no. 1 and 6) in the upper row on the EML224 keyboard.
- Turn the EML224 “on” and keep the two soft keys pressed down until the screen shows the normal picture. This may take as long as app. 30 seconds. You should normally hear 4 “beeps” at the end of the procedure.

**Upgrading Software**

New software versions are released from time to time. The EML224 with Compact Flash (CF) can be updated by performing the following software upgrade procedure.

1. If you have received a programmed compact flash, skip stage 2.
2. Copy the received/downloaded software file into the root folder of Compact Flash card. The name of the file is not relevant. Also copy the latest version of setup.exe into the root folder.

   **Note:** Standard Compact Flash reader is needed to be attached to the PC.

   **Note:** It is possible to use the Compact Flash card, which is already installed in the display unit.

3. Switch “off” the mains of the display unit and insert Compact Flash card with the new software on it.
4. Press the “hidden” button inside the cabinet (mounted on the solder side of the keyboard). Keeping the hidden button pressed, switch “on” the mains in the display unit and keep the button pressed while the message “You may release the upgrade button” appears in the lower part of the screen. If a new setup.exe is to be loaded, follow the on screen instructions.
5. Release the hidden button. After few diagnostic text messages, the list of available software versions will appear in the lower part of the screen as in example below.
6. **Note:** If the bootloader does not find any file with the software on the Compact Flash, the presently installed version will start automatically. In this case, make sure, that the upgrade and setup file has been copied correctly on the Compact Flash and repeat procedure.

```
<table>
<thead>
<tr>
<th>1.27.21</th>
<th>1.27.23</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>External</td>
</tr>
</tbody>
</table>

[KEY 1] [KEY 2] [KEY 3] [KEY 4] [KEY 5] [KEY 6]
```

7. Select a software version, which you would like to install. Normally, it is possible to chose one out of two: the version, which is currently installed in the internal memory (indicated as Active) and the upgrade version (indicated as External). The version name is displayed in the upper line of the text lines, located just above the corresponding soft key. In the example above, soft key #2 should be pressed to select the latest software version.
8. Confirm selection by pressing YES button (or go back to selection, pressing NO).
9. Press any button to start the upgraded software (or it will start automatically in 5 seconds).
10. **Note:** The file with a previous software version will be copied back to the Compact Flash card, so it would be possible to re-install it in the similar manner, if desired.
10. Service

All service requests should be made to the local SKIPPER representative.

Adjustments and repairs should only be performed by qualified service engineers, and unqualified repair attempts will void the warranty.
11. Appendix

Miscellaneous Installation Drawings.

- Fig. 11.1 EML224 System overview. See “Fig. 11.1. EML224 System overview” on page 57.
- Fig. 11.2 Terminal board connection. See “Fig. 11.2. Terminal board connections” on page 58.
- Fig. 11.3 Outline dimensions display unit. See “Fig. 11.3 Outline dimensions Display Unit” on page 59.
- Fig. 11.4 Outline dimensions electronic unit. See “Fig. 11.4 Outline dimensions Electronic Unit” on page 60.
- Fig. 11.5 Cable gland connections. See “Fig. 11.5 Cable gland connection” on page 61.
Fig. 11.1. EML224 System overview
Fig. 11.2. Terminal board connections
Fig. 11.3 Outline dimensions Display Unit
Fig. 11.4 Outline dimensions Electronic Unit
The assembly of cable gland is quick and easy:

1. Partially expose the braided screen by removing the outer sheath of the cable at a length of approx. 10 mm

2. Insert the cable through the dome nut and the gland body until the contact spring is pressed against the braided screen.

3. Firmly screw on dome nut.

Cable glands play an important part in safeguarding EMC requirements where cables and leads enter into a shielding system. They have to ensure a permanent connection with very low ohmic or inductive resistance between the cable shield and the housing potential.

Fig. 11.5 Cable gland connection
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