SKIPPER

EML224 / EMR224

Two-axis Electromagnetic Log

Installation And

Operating Manual

Version 2.1 921214
Software Version 2.0

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1. Introduction

System overview.

The EML224 is a two-axis electromagnetic log with a graphic display, which has the possibilities of displaying a number of variables in both numerical and graphic form. The information from the stainless steel 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.
An electromagnetic log will of course give direction of speed in both axes (Ahead/Astern, Starboard/Port). This is of great importance during maneouvering or when running at low speeds. The speed range is the same Astern and Ahead. The user may optionally select display text languages as well as various units of measure.

The EMR224 is a dedicated repeater unit with limited keyboard and interfacing capabilities.

Sensor.

The sensor is an active electromagnetic log built in a stainless steel housing. A stainless steel hull fitting with a ball valve is welded into the hull and facilitates straight forward sensor removal and maintenance. 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 transducer. The sensor has no moving parts and protrudes only a few milli-meters outside the hull.
The sensor is interfaced through a junction box which also contains the power supply. This junction box is mounted near the hull fitting, and two pairs of cable are led to the display unit for digital signal transmission. The power consumption of the Sensor is appx. 10W, and 220V AC or 24V DC versions are available.

Display unit.

The display unit consists of a keyboard and a graphic dot-matrix supertwist LCD display. The display is backlit, and contrast and backlight intensity may be adjusted by the user. A supertwist LCD has superior contrast and viewing angle compared to standard LCD´s. Backlit liquid crystal displays are in general the best choice for variable ambient light requirements. The display unit may be flush mounted or fitted on a bracket. Power supply options are 220V AC or 24V DC. The power consumption is appx. 6 Watts at 220V AC or 3 Watts at 24V DC.

Fig. 1.1 shows the layout of a EML224 Main Display unit and Fig. 1.2 shows the EMR224 Repeater..

Operation.

The display unit has 4 operation screens that are selected by the 4 "SCREEN" buttons A, B, C, and D. Use of the operation screens is chosen by the user depending on current preferences and requirements.

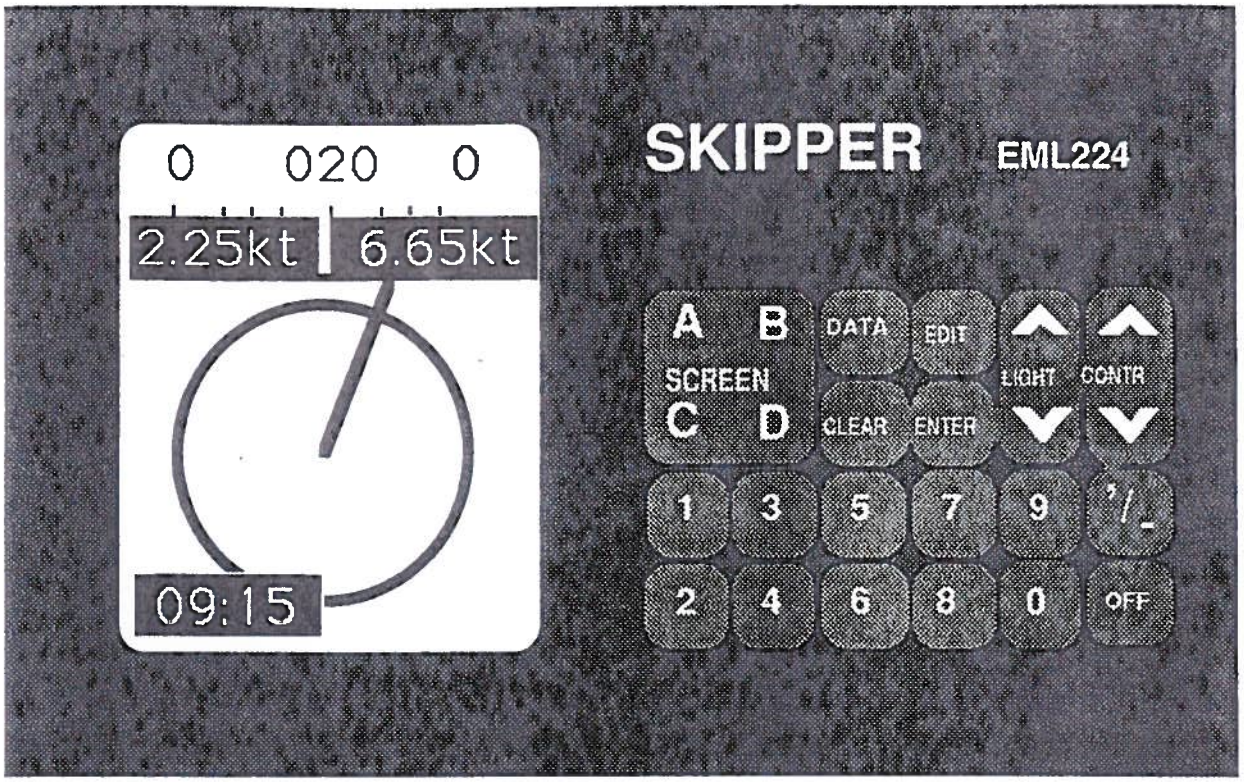


Fig. 1.1 Main Display Unit Panel Layout

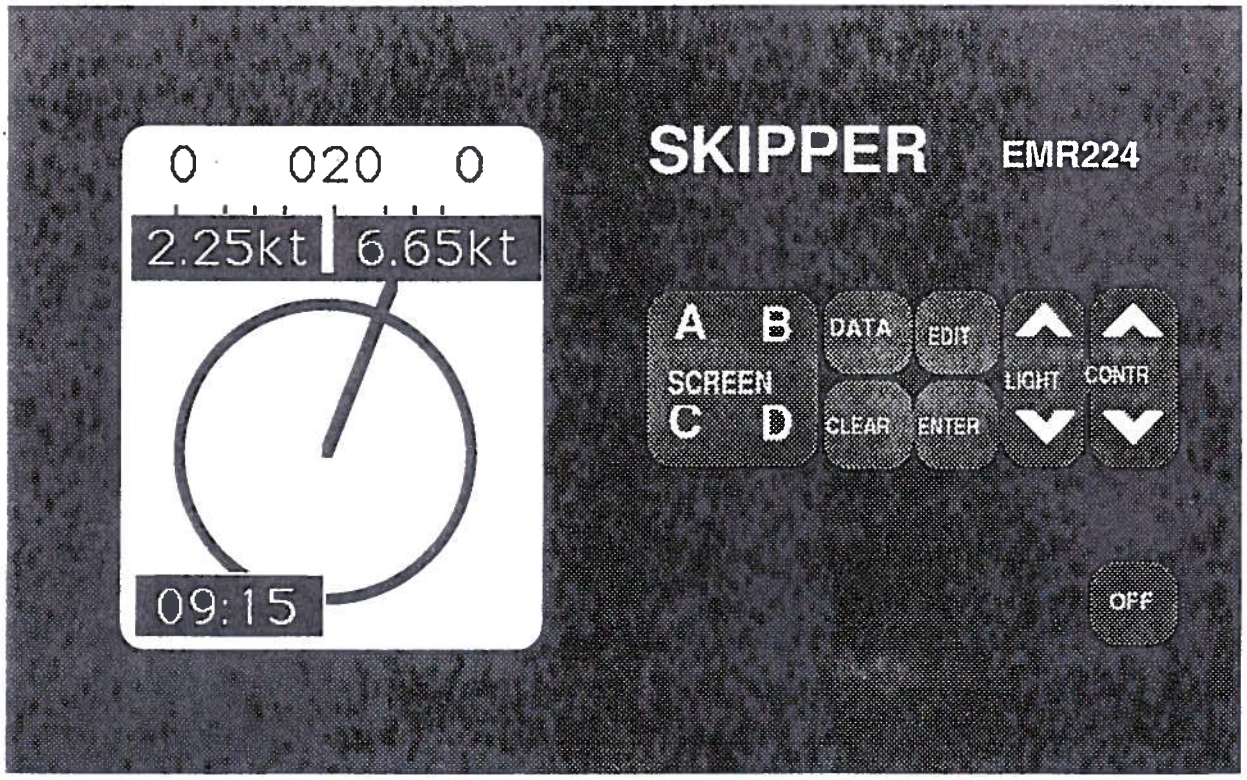


Fig. 1.2 Repeater Panel Layout

Interfacing.

The EML224 has various interface possibilities. There are outputs provided for 4-20 mA analogue signal as well as 100/200 pulses per nautical mile.
The EML224 is also equipped with NMEA 0183 interface output. An external alarm output is provided as well. All such signals are interfaced in the Display unit.

Repeaters.

A number of full function repeaters may be connected to the system, and all the repeaters may be controlled individually. A normal EML224 system unit may be used as repeater, or EMR224 repeaters with limited keyboard and interface capabilities may be fitted instead.

Data entry.

Several data entry screens may be selected to enter various settings and calibration parameters. The user is prompted by descriptive keywords.

The C and D operation screens have assigned DATA screens (C1 - D1, D2, D3, D4) which may be accessed by the DATA button whenever the appropriate operation screen is active. See Sections 3 & 4 for information on parameter entry.

Alarms.

High and low alarms may be selected from the alarm screen, DATA screen D3. A potential free relay contact is provided in EML224 units for interface to external alarm systems.

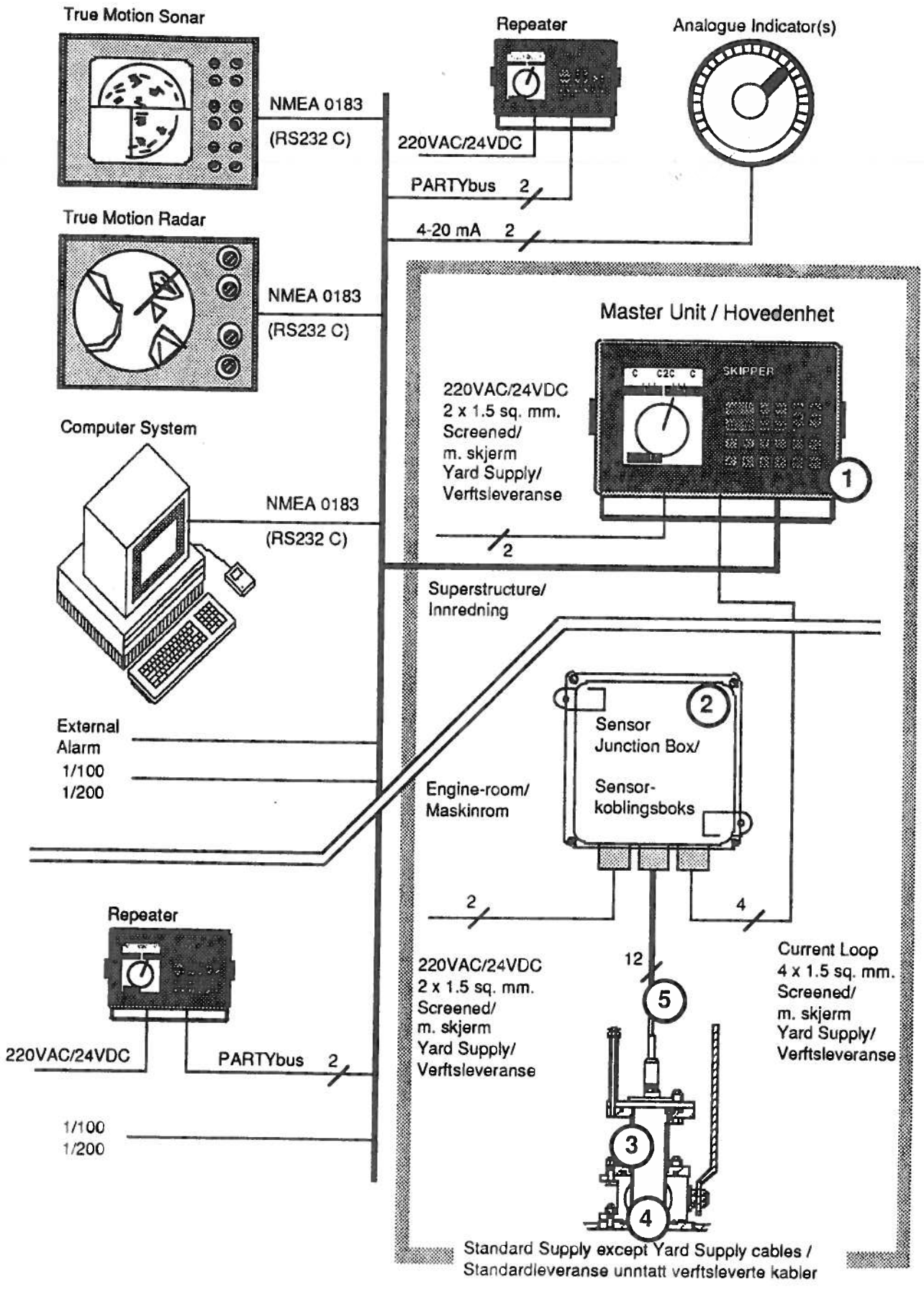


Fig. 1.3 **System Diagram**

Standard System Supply.

A Basic EML224 system consists of the following units.
(See **Fig. 1.3** on the previous page.):

Pos.	Description
1	Master Unit
2	Sensor Junction Box
3	Transducer Hull Fitting
4	Transducer
5	Cable from Transducer to Sensor Junction Box

Hull Fitting.

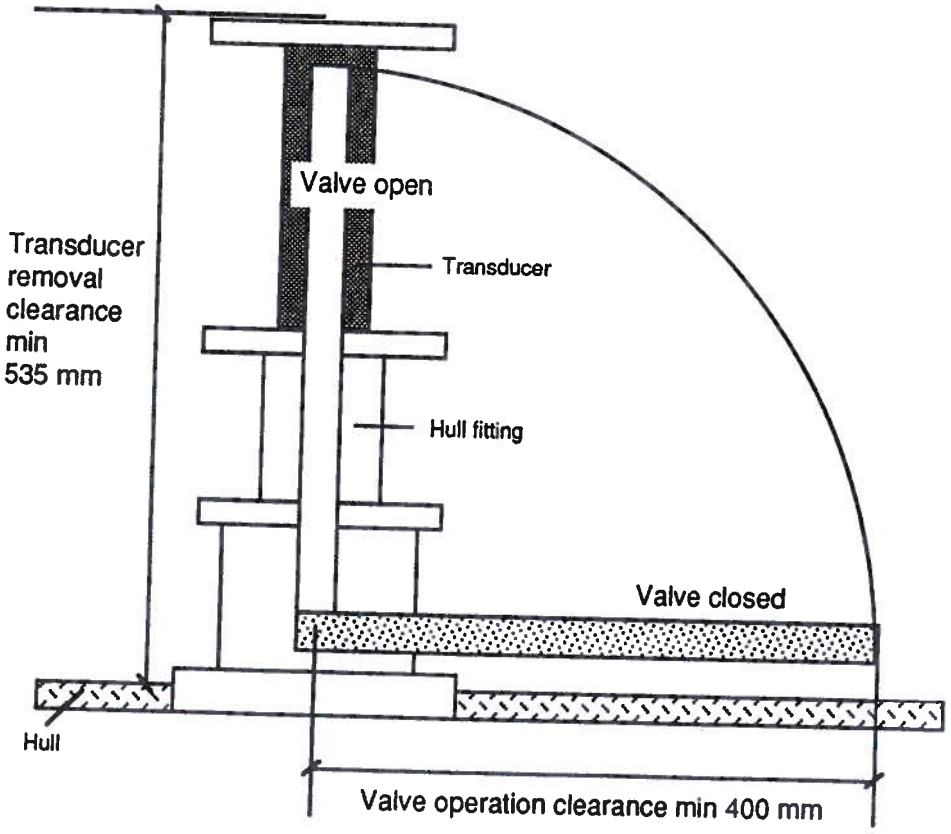


Fig. 2.1 Hull Fitting service clearances.

Location.

In order to facilitate the calibration procedure, the transducer should be installed as close as possible to the bulb or the stem of the ship, avoiding areas where it may be damaged by the anchor chain.
It is of course necessary to select a part of the hull that is submerged under all load and speed conditions.
The cable and plug connecting the Sensor to the Junction box are basically water and fuel resistant, but it is recommended to install the hull fitting in a dry coffer-dam for service access reasons.
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 dual axis sensor. In this case, special length hull fitting and sensor may be ordered from SKIPPER.
Before hull fitting installation procedure is initiated, always check that the Hull fitting 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 Fig. 2.1.

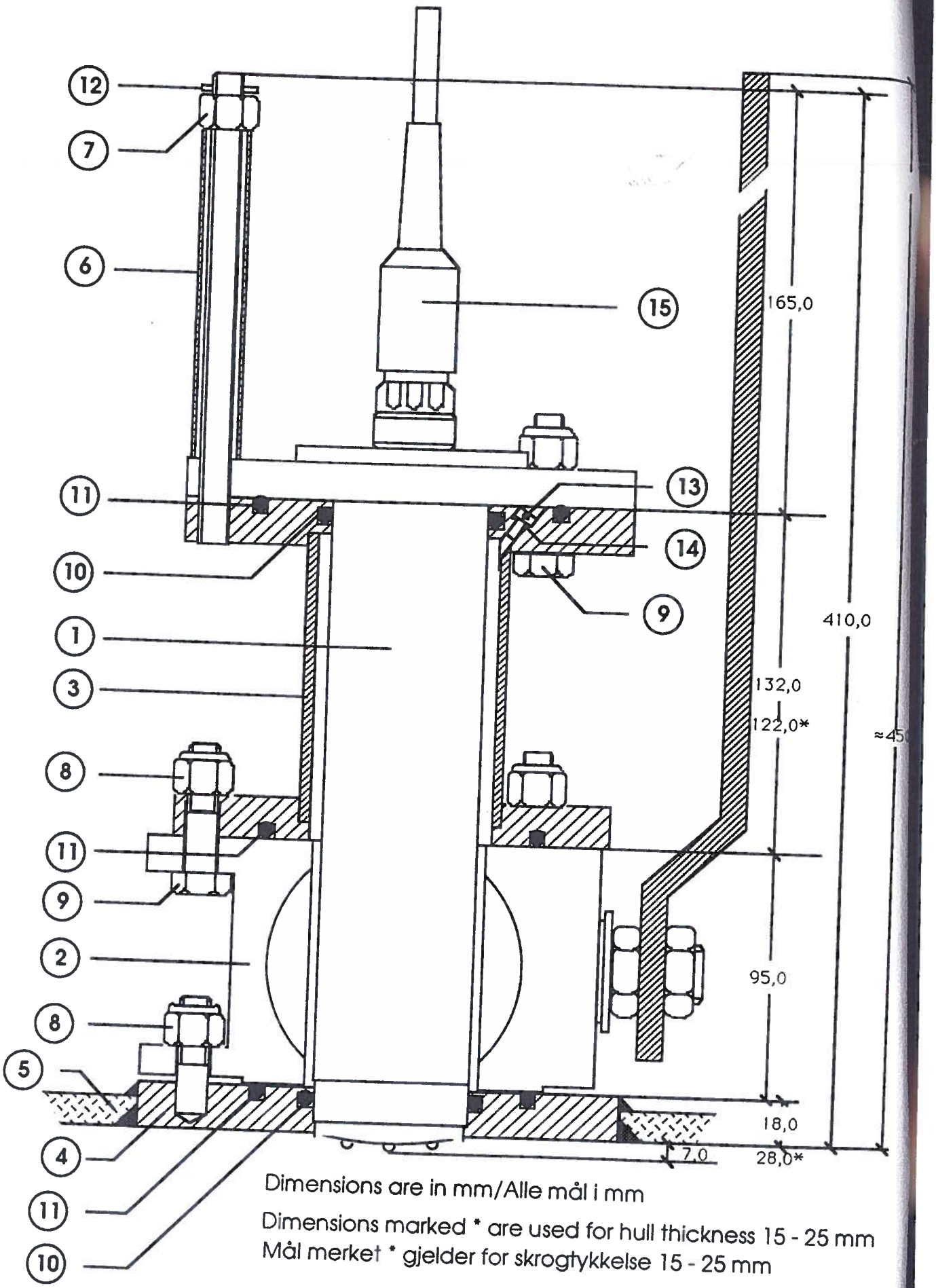
Hull fitting assembly.

No.	Qty.	Description
1	1	Transducer.
2	1	Ball valve
3	1	Intermediate element
4	1	Bottom flange to be welded
5	1	Hull of ship
6	2	Protection tube
7	2	Nut Hu12 316L
8	10	Nystop Nut MP12 316L
9	4	Screw H12x45 316L
10	2	"O" ring R35 neoprene
11	3	"O" ring 110,7x3,53 neoprene
12	2	Split pin dia. 2, 316L
13	1	Vent screw
14	1	"O" ring dia int 2,6 tore 1
15	1	Plug and cable

Table 2.1 List of materials for hull fitting with ball valve

The standard Bottom Flange is used for hull thickness less than 15 mm.
A bottom flange for hull thicknesses between 15 and 25 mm is supplied on order.

Fig. 2.2 Hull fitting and ball valve assembly (See next page).



Dimensions are in mm/Alle mål i mm

Dimensions marked * are used for hull thickness 15 - 25 mm
Mål merket * gjelder for skrogtykkelse 15 - 25 mm

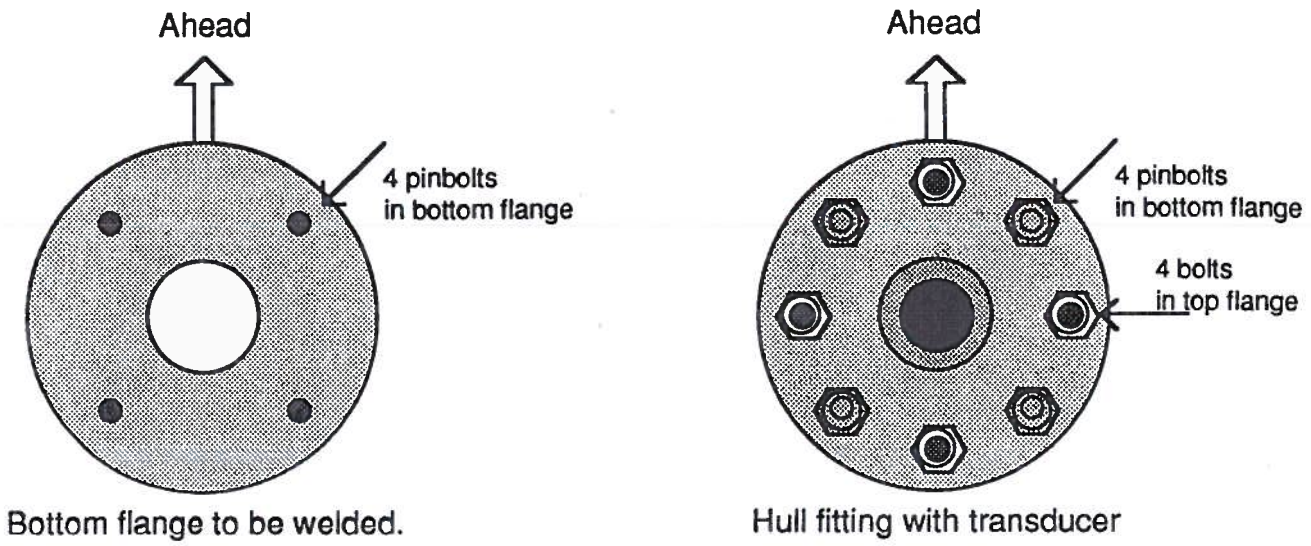


Fig. 2.3 Alignment of hull fitting bottom flange for welding.

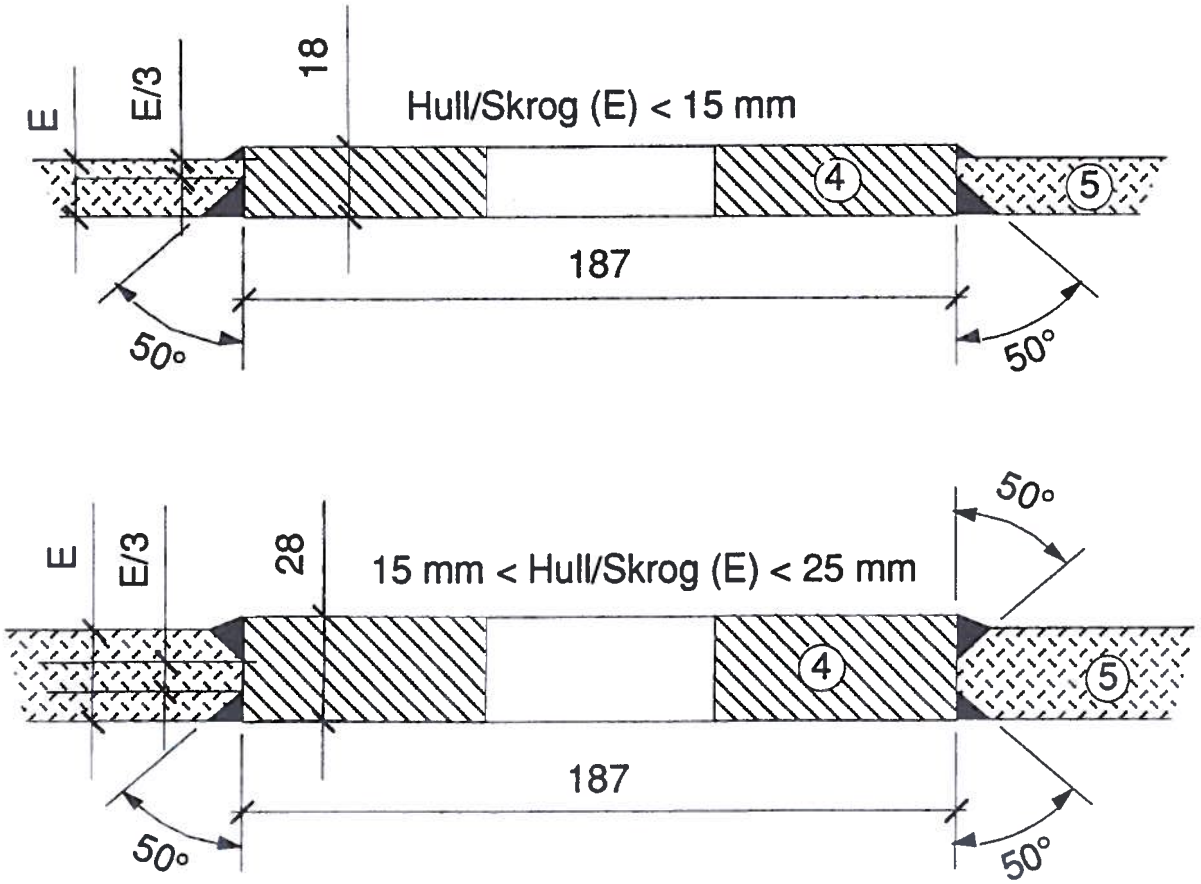


Fig. 2.4 Recommended hull cross section profile for welding.

Part positioning and Welding.

The Hull Fitting must be aligned so that a line through 2 opposite holes in the T **Flange** is **parallel** to the longitudinal axis of the vessel. This corresponds to a lin through 2 opposite pinbolts in the **Bottom Flange** forming a **45° angle** with the longitudinal axis. See Fig. 2.3.
See Fig. 2.2 for optimal hull cross section profile for welding, left side for hull thicknesses less than 15 mm, right side for hull thicknesses between 15 mm and 25 mm.

Required electrodes

Steel hull: Type SAF 24, 12 or. equivalent
Aluminium hull: Filler metal = AG4 or AG4 MC.

Welding precautions.

Separate the bottom flange from the remaining hull fitting assembly before weldi Use a board to ensure that the bottom flange is flush with the external surface of the hull.
Before welding, remove the "O" rings. Remember to apply grease when refitting them.
After welding, check that the outer weld filling has been properly ground down.
Paint the hull fitting as well as the hull itself with a suitable anti-corrosion/anti-fouling product, but do not paint the transducer electrodes.
Clean the electrodes with ethanol or iso-propanol before fitting the transducer.

Transducer installation.

1. Take off the two split pins and the protection tubes.
2. Ensure that the vent screw is closed and that the "O" rings are greased and fitted. The vent screw may be opened temporarily to align pressure differences during transducer installation before the ball valve is opened.
3. Insert the sensor with the arrow pointing towards the prow until the two threaded guides are engaged in the the corresponding flange holes.
4. Screw the two nuts onto the guides till they cover the split pin holes to temporarily keep the sensor in place.
5. Open the valve.
6. Push down the transducer until the flanges make contact and tighten the two bolts with nylstop nuts.
7. Remove the nuts on the guides, fit the protection tubes, remount the nuts and fit the split pins.

The Junction Box.

The junction box contains the power supplies for the transducer. It must be installed fairly close to the Hull Fitting as the standard cable is 10 mtrs. The junction box should be fitted on a vertical surface in a dry area. An optional 25 mtr. cable may be ordered if required.

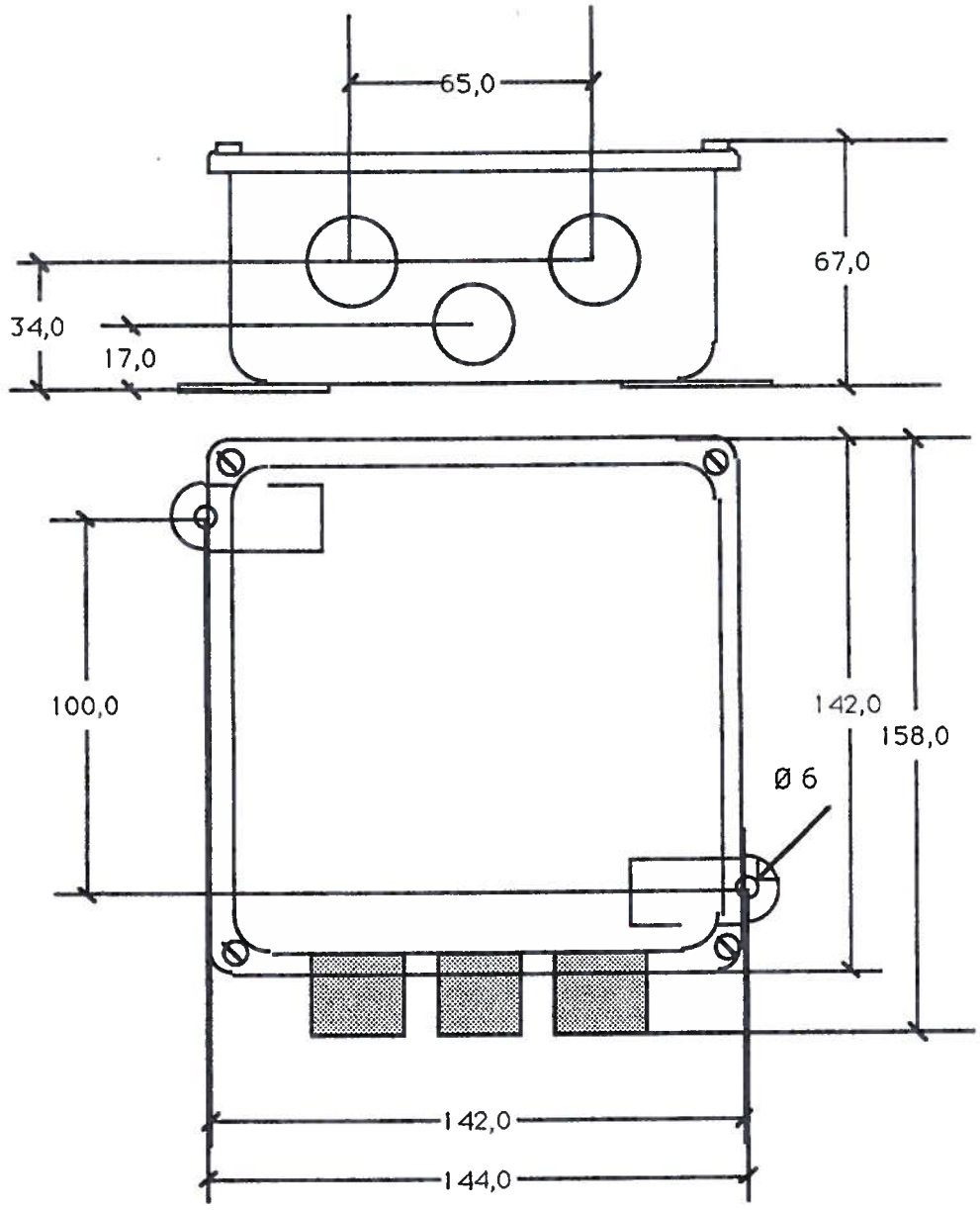


Fig. 2.5 Sensor Junction box, Dimensions.

Transducer/Junction box interconnection.

The transducer is connected to the junction box with the supplied 12 wire cable. Th watertight plug is screwed onto the sensor and the 12 wires terminated in the junction box. The cable screen is fixed in the junction box with the screw provided. The wires are identified with numbers or colours according to the following table.

No	Colour	Signal
1	Brown	Signal Ground
2	Red	+9,5 V logic circuits
3	Orange	+20 V analogue circuits
4	Yellow	-20 V analogue circuits
5	Dark Green	27 V inductor (-)
6	Dark Blue	27 V inductor (+)
7	Rose/Purple	RX+ transducer
8	Grey	RX- transducer
9	White	(+) pulse output
10	Black	(-) pulse output
11	Light Green	TX+ transducer
12	Light Blue	TX- transducer

Supply for the junction box and transducer is 220V AC standard. It may be configured for 110V AC. A 24 V DC power-supply may be supplied on request.

The circuit board in the junction box is equipped with several LED lamps indicating the state of various voltages and signals. In order to facilitate trouble shooting, a list of the LED´s and a description of their function is given in the following table. Fig. 2 shows the location of LED lamps and fuses.

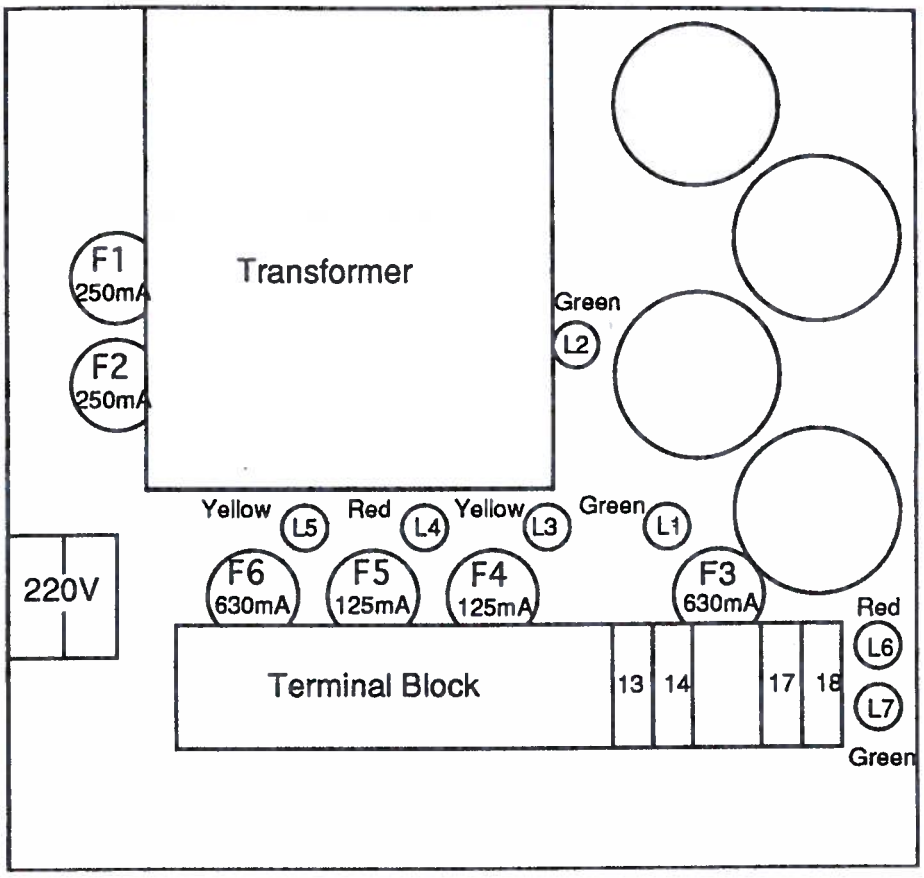


Fig. 2.6 Sensor Junction box, Location of Fuses and LEDs.

LED	Colour	Signal	Function	Fuse
L5	Yellow	9,5V	Voltage indicator	F6
L4	Red	-20V	Voltage indicator	F5
L3	Yellow	+20V	Voltage indicator	F4
L1	Green	+27V	Voltage indicator	F3
L2	Green	Current	Flashing at 2 Hz with the field inducting current.	
L6	Red	Curr. loop	Flashing when sensor receives data from Display. (Only during programming).	
L7	Green	Curr. loop	Flashing when sensor transmits data to Display. (On in-between data sequences).	

If all LEDs are out, one of the fuses F1 or F2 is burnt.

Display unit installation.

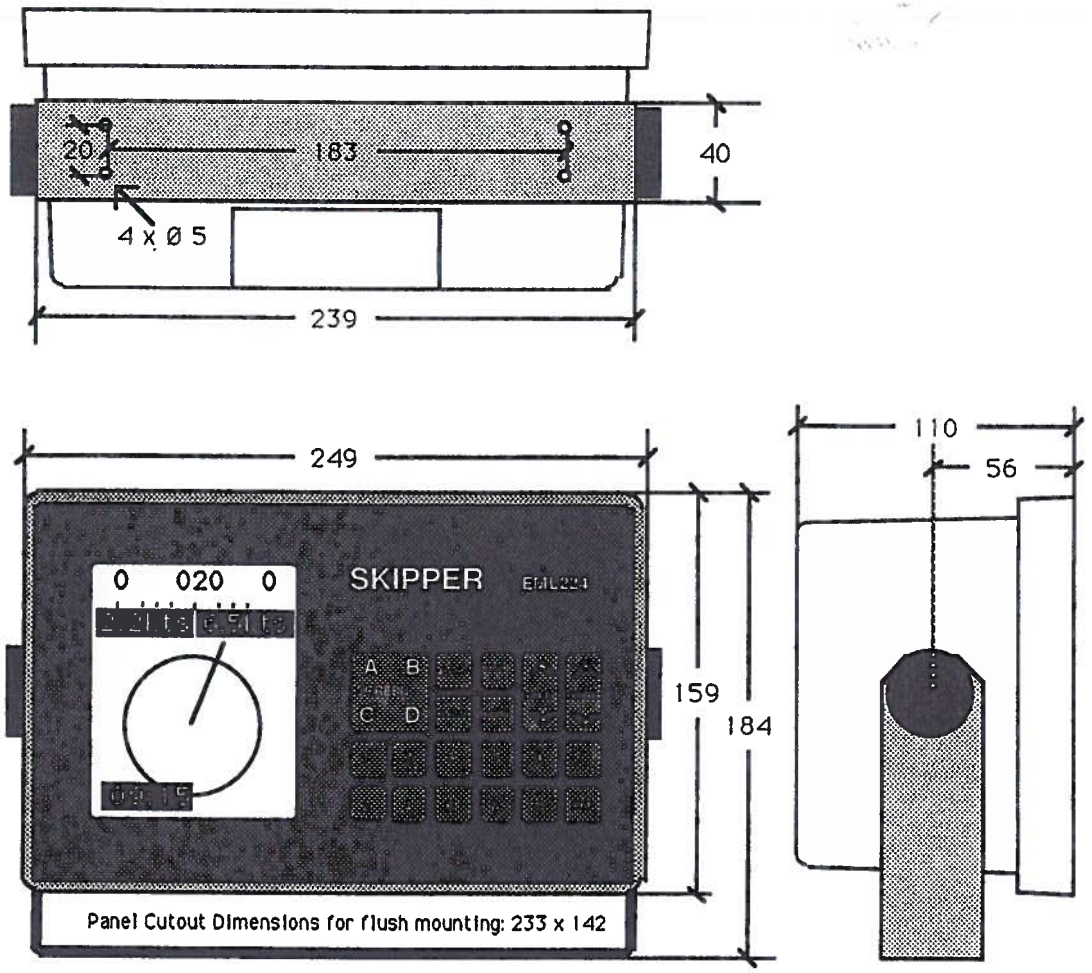


Fig 2.7 Display unit, Dimensions.

The display unit may be mounted flush in a panel or by means of a bracket. Fig. 2.7 shows the display unit mounted on the bracket. If the unit is to be flush mounted, th bracket is removed and the two support screws are temporarily unscrewed from the inside of the cabinet to facilitate placement of the cabinet in the cut-out. The support screws are then replaced, and the two supplied angle brackets are mounted onto the support screws and held by the serrated finger-nuts to keep the cabinet fixed in the cut-out. The angle brackets may be fixed to the front panel if required.

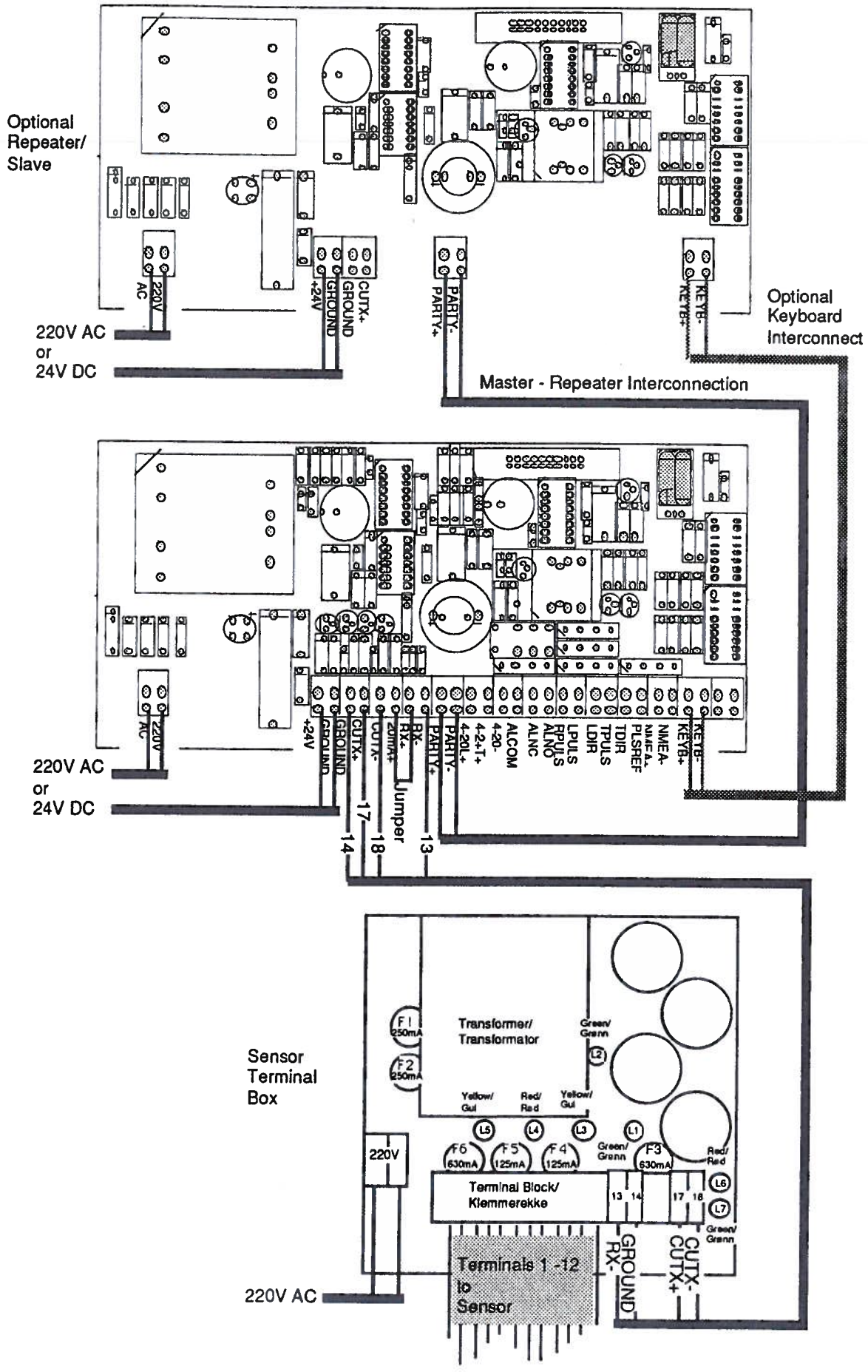


Fig. 2.8 Main System Connection Diagram with optional Repeater.

Do not perform installation work with system power applied!!

Cables are led through the three glands as follows:
The cable from the sensor should normally occupy the centre gland. The left gland is used for power supply connection whereas the right one is used for any interface signals connected.
Power supply may be either 220V/110V AC or 24V DC. Power consumption is appx. 3 W. for each display unit at 24V, appx. 6W at 220V.
The sensor is always connected to the main master unit with 4 wires. Two for serial data in each direction. See Fig 2.8.

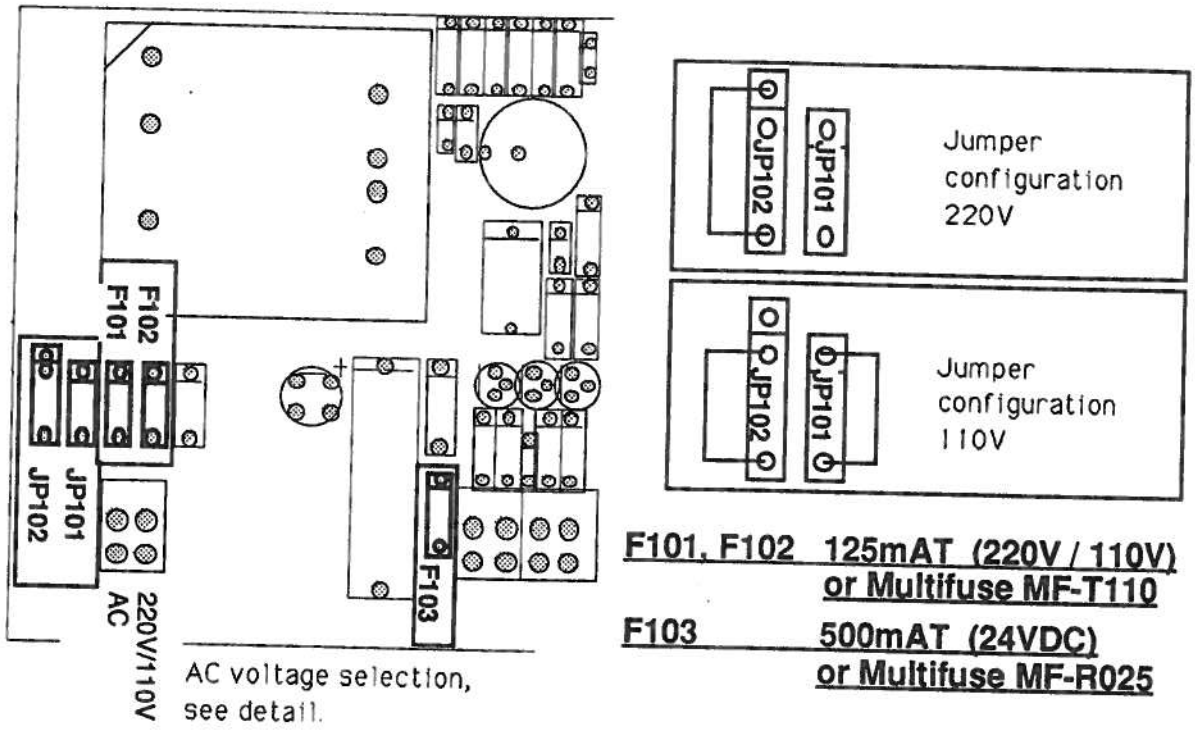


Fig. 2.9 Voltage selection jumpers and fuses.

If the AC power system is 110V, EML224 may be prepared for 110V AC by re-connecting the jumpers JP 101, JP102 as shown in Fig. 2.9.
This diagram also shows position of fuses for 220/110 VAC and 24 VDC. These fuses are soldered into the board, and are intended only for protection in case of circuit failure. Some units are equipped with Multifuse™ electronic fuses. If the unit does not operate because the voltage drop across either fuse is significant, i.e. the fuse is open take the unit to a service representative.

When the installation is complete, and power is connected to the Display Unit, the unit is swiched on by pressing any button. The unit is switched off by pressing the "OFF" button.

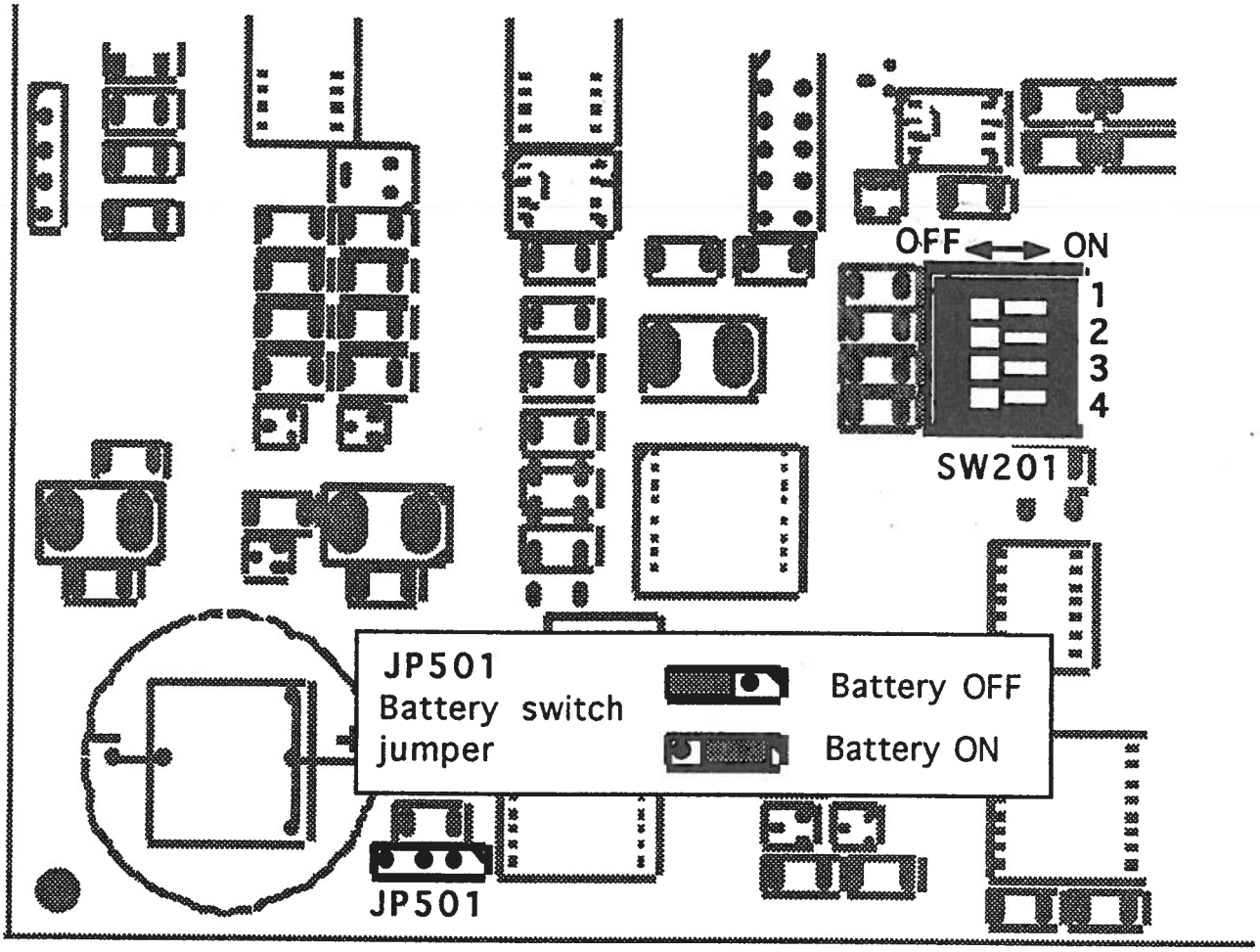


Fig. 2.10 Back-up Battery Switch Jumper and Programming switches.

Back-up Battery Switch

After installation is complete and system power is applied, it is necessary to switch on the real time clock battery to provide power to the clock and selected memories during system power failure. Refer to Fig. 2.10 for the correct setting of the Clock Battery Jumper "ON" position. This jumper should be set to the "OFF" position only during extended unit storage periods. The onboard battery is loaded only when no power is applied to the power terminals.

Programming Switches, SW201

		"OFF"	"ON"
SW201-1	Master/Repeater Identification	Master	Repeater
SW201-2	Not used		
SW201-3	Not used		
SW201-4	Display type Selector	Toshiba 1013	Optrex 5003

Fig. 2.10 indicates position of the SW 201 switch bank.

Interfacing

Repeaters/Slaves

One master and several repeaters may be connected to one system log sensor. The master and all repeaters are looped together by interconnecting the PARTY+ and PARTY- terminals of all display units. Each display unit must be connected independently to it´s power supply, and the sensor is connected only to the master unit. See Fig. 2.8 or 2.11.
If the repeaters are switched off during system operation, the distance logs in the repeaters may not show the same values as the main master.

Calibration must be carried out in the master unit only!

The repeater unit EMR224 does not have the numeric keyboard installed. In order to access all programming functions in an EMR224, the repeater must be connected to an EML224 Keyboard via the KEYB+ and KEYB- terminals, or to a separate programming keyboard. See Fig. 2.8 or 2.11.

All units connected to the Party bus should be kept switched on to maintain system integrity.

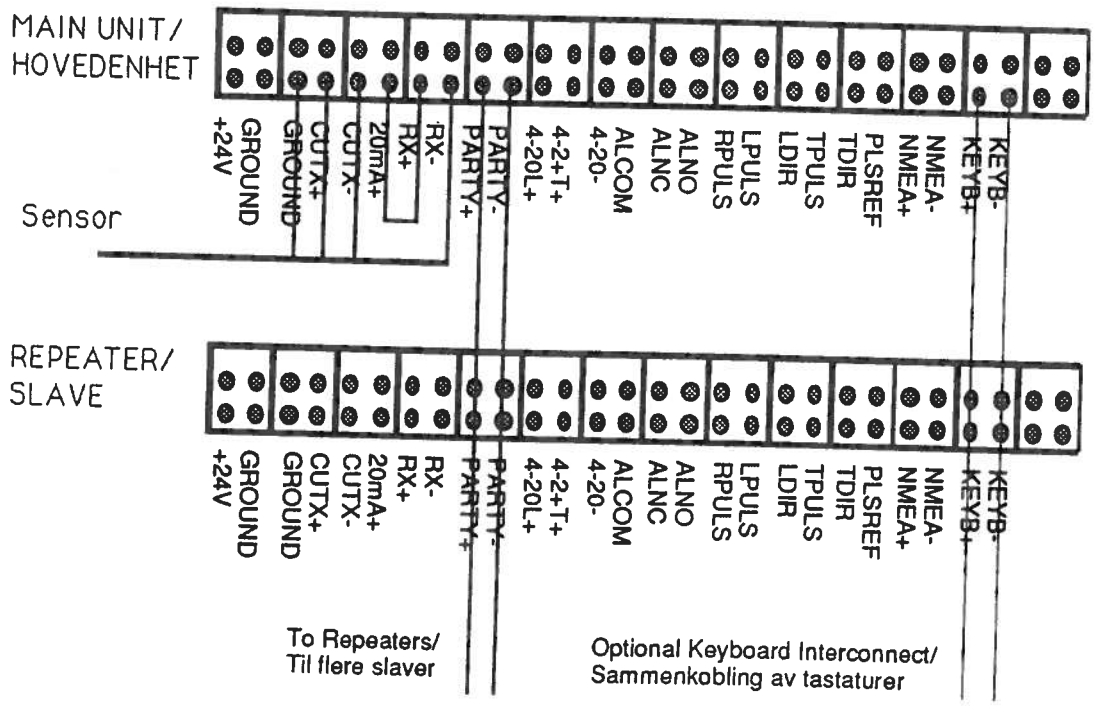


Fig. 2.11 Master - Slave Interconnection.

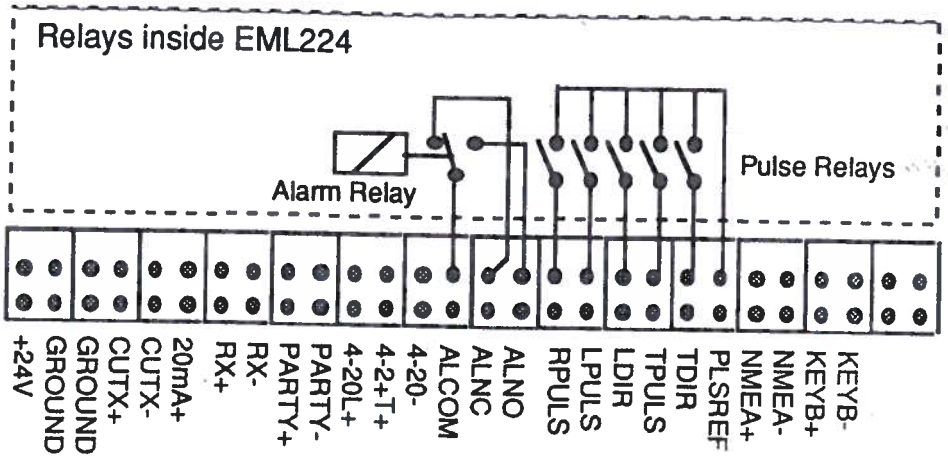


Fig. 2.12 External Alarm and Pulse Outputs.

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. 2.12.

The terminals have the following significance:

ALCOM	Common terminal of contact.
ALNC	Normally closed contact (Normal = "No alarm" condition)
ALNO	Normally open contact

Pulse interfaces

The pulse outputs are galvanically insulated reed relay contacts connected directly to the terminals. The number of pulses per nautical mile may be selected from DATA Screen D4. Pulse duty cycle is 50%. See Fig. 2.12.

Pulse interface terminals are as follows:

PLSREF	Common terminal for pulse relay contacts
TDIR	Transversal direction. Closed contact = Starboard.
TPULS	Pulse output for transversal speed.
LDIR	Longitudinal/Resultant direction. Closed contact = Astern.
LPULS	Pulse output for longitudinal speed.
RPULS	Pulse output for resultant speed.

Analogue interfaces

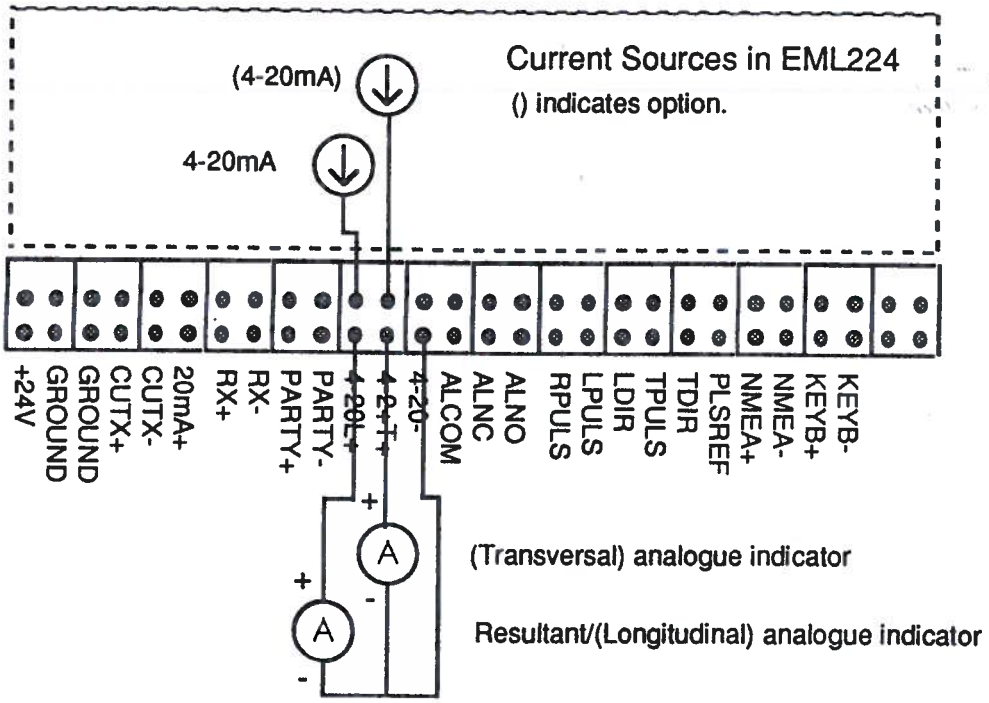


Fig. 2.13 Analogue outputs.

EML224 is equipped with analogue outputs to supply analogue repeaters or other equipment with analogue inputs. The signals are galvanically connected to the EML224. Standard range is 4-20 mA corresponding to Full ASTERN-Full AHEAD. The max Full AHEAD(= Full ASTERN) range is selected from DATA Screen D4. See Fig. 2.13.

Analogue outputs from the EML224 have the following significance:

4-20-	Negative common for analogue outputs
4-20T+	Analogue output for transversal speed (option)
4-20L+	Analogue output for Resultant (optionally longitudinal) speed

NMEA interface

The NMEA output provide NMEA0183 format log information for other equipment with NMEA0183 inputs. Baud rate is 4800, 8 bit, No parity. A message containing all speed and drift angle information from the log is transmitted every 2.5 seconds.

NMEA-	Reference terminal for NMEA signal.
NMEA+	NMEA signal.

The following messages are transmitted:

$VMVRW	Velocity-sensor Magnetic Velocity Resultant relative Water
$VMVLW	Velocity-sensor Magnetic Velocity Longitudinal relative Water
$VMVTW	Velocity-sensor Magnetic Velocity Transversal relative Water
$VMDEW	Velocity-sensor Magnetic Drift Element relative Water

General message format:

$VMFFF,(-)(X)(X)X.X,(N)(D)	"VM=Talker" "FFF=Sentence formatter (see above)" "(-) (X)= Sign or digit used as applicable" ",=Field delimiter" ".=Decimal point" "X=digit" "(N)(D)=kNots or Degrees unit as applicable"

External Keyboard (Option)

The unit may optionally be operated from a remote keyboard.

KEYB-	Reference terminal for Keyboard.
KEYB+	Keyboard signal.

IF the KEYB- and KEYB+ terminals of two or more units are interconnected, keyboard operation of either unit will affect all the interconnected ones.

DATA entry

The DATA screens facilitates entry of parameters, setpoints and other data. The following flow chart illustrates the procedure for entering data into the entry fields. The various DATA screens are shown in detail in the Operation Section.

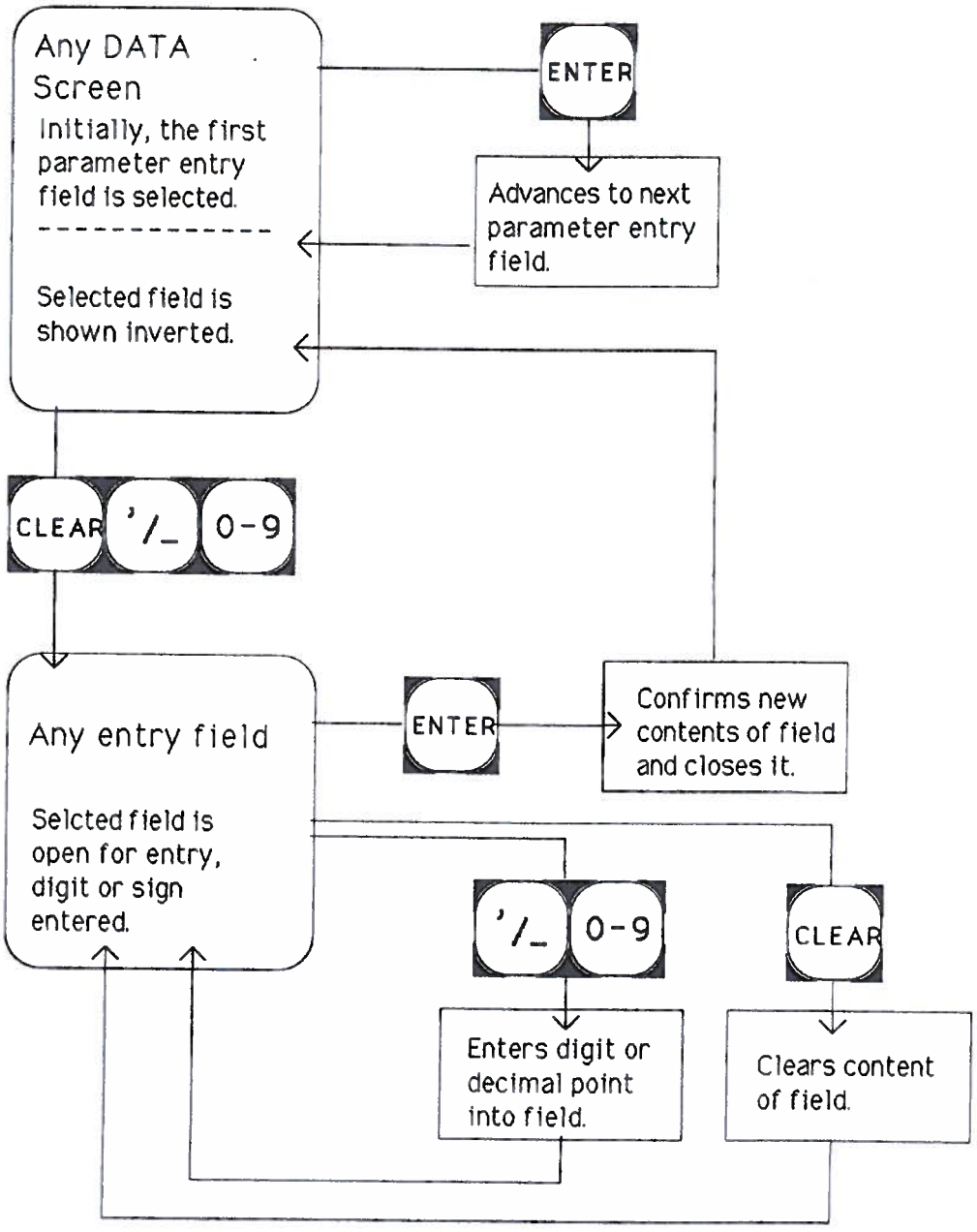


Fig. 3.1 Parameter DATA Entry Flowchart

Calibration.

The calibration screens facilitates entry of calibration and filtering parameters e. g.:

- Sensor installation angle offset.
- Linear or non-linear correction of measured speed (Depending on hull shape and sensor installation).
- Linear correction of sea temperature measurement (Normally not required).
- Filtering constants for speed and temperature.
- Calibration of analogue and pulse outputs.

The calibration screen (DATA screen D4) facilitates entry of calibration and filtering parameters according to the following list. The functions in **bold** are considered the most important, and adjustment of the others will not normally be required. The parameters marked "No user adjustment" are listed for reference only, and should not be modified:

Parameter **No.**	Description	Entry unit (**Val**)	Comment
1	Sensor serial no.	Alpha-numeric	No user adjustment
2	Customer ref.	Alpha-numeric	No user adjustment
3	Async. com. rate	One digit numeric	No user adjustment
4	**Sensor Installation**	**One Digit numeric**	**0 = 0° offset** **1 = 90° CCW** **2 = 180°** **3 = 90° CW**
5	Internal constant.		No user adjustment
6	Internal constant		No user adjustment
7	Factory calibration		No user adjustment
8	Factory calibration		No user adjustment
9	Internal constant		No user adjustment
10	**C1**	**Numeric F. point**	**Linearization const.**
11	**C2**	**Numeric F. point**	**Linearization const.**
12	**C3**	**Numeric F. point**	**Linearization const.**
13	Internal constant		No user adjustment
14	**Speed filter**	**Seconds**	**Speed filter const.**
15	Acceleration filter		No user adjustment
16	Temperature filter	Seconds	Temp. filter const.
17	Acceleration const.		No user adjustment
18	Acceleration const.		No user adjustment
19	Pulses per nm		No user adjustment
20	Internal constant		No user adjustment
21	Temperature gain	0.1°K	Default = 10000
22	Temperature zero	0.1°K	Default = -2730
23	Internal constant		No user adjustment

All the parameters in the above list are stored in the sensor, and can not be accessed unless a sensor is connected and fully functional!

Example of parameter entry.

Let us say you want to enter a value of **1.345** for the speed calibration parameter C1.

Select Operation screen D and press DATA button 4 times to reach DATA screen D4.

Press in sequence "**1**", "**0**", "**ENTER**" to enter parameter number "**10**" into the No. field. The value currently valid for the C1 parameter will now appear in the Val. field. Press "**ENTER**" once to open the Val field for entry. Press in sequence "**1**", "**,/-**", "**3**", "**4**", "**5**", "**ENTER**". The new value for C1 is now stored in the sensor.

Linear Calibration.

If linear speed correction is satisfactory, calibration consists of performing a speed test near full service speed and then calculation and entry of the linear calibration parameter C1.
First make sure that parameter C1 = 1.000 and parameters C2 and C3 both = 0.000. Always remember to run the test range at least once in each direction to compensate for wind and currents. Observe the speed indicated on the EML224 in knots, and calculate the real speed in knots by recording the test range distance in nautical miles and the running time for each run in decimal-hours. Use the following formulae to determine a new value for parameter C1:

$$\text{Running time (Decimal-hours)} = \text{Hours} + \frac{\text{minutes}}{60} + \frac{\text{seconds}}{3600}$$

$$\text{Real Speed (kts)} = \frac{2 * \text{Test Range Distance (nm)}}{\text{Sum of Running times (decimal-hours)}}$$

$$\text{New parameter C1} = \frac{\text{Real Speed (kts)}}{\text{EML224 indicated Speed (kts)}}$$

Analogue And Pulse Output Range Selection.

The DATA screen D4 may also be used to set number of pulses per nautical mile (100 or 200) for the pulse outputs.
Full range speed for the analogue output may also be set, e.g. 30 kts AHEAD corresponding to 20 mA / 30 kts ASTERN Corresponding to 4 mA.

Non-linear Calibration (Option).

If better accuracy is required or if the hull shape creates non-linearities, it is necessary to run speed tests at several characteristic speed levels and then to enter the indicated/calculated speed pairs. In this manner, it is possible to obtain indication accuracies better than 1% throughout the speed range.

Function codes.

The repeater unit EMR224 does not have the numeric keyboard installed. In order to access all programming functions in an EMR224, the repeater must be connected to an EML224 Keyboard via the KEYB+ and KEYB- terminals, or to a separate programming keyboard. See Fig. 2.8.

Function codes may be used to activate various user selections, e.g:

- Acoustic keyboard response ON/OFF.
- Alarm System ON/OFF.
- Normal Display/Inverted Display (may improve night-reading properties).
- Selection of English, Norwegian, French or Spanish display texts.
- Selection of various units of measure for temperature, speed and distance.

The following **Func**-tion codes may be used from DATA screen D1 to activate various user selections:

Code reference	Function performed
0	No operation
1	Keyboard beep on
2	Keyboard beep off
3	Alarm system on
4	Alarm system off
5	Normal Display
6	Inverse Display
10	English Display-texts
11	Norwegian Display-texts
12	Spanish Display-texts
13	French Display-texts
14	Degree unit = Celsius
15	Degree unit = Fahrenheit
16	Distance/Speed units = Nm/Kts
17	Distance/Speed units = Km/Km/h
100	Activate simulation screens
110	Read EEPROM-Permanent Data
111	Write EEPROM-Permanent Data
120	Screen Reset
127	System Reset (Use with care!!)

Screen Reset.

Screen reset reactivates all screen elements on all screens, i.e. elements that may have been switched off by the EDIT function.

System Reset (Use with care!!).

System Reset performs a total system reset on the display unit. All non-volatile memory is re-initialized and all user parameters in the display unit are lost.

Language is forced to English, Units are forced to centigrade, Nm/Kts. 200 pulse pr Nm, Analogue Range 30 kts. Distance logs are reset, Operation Screen A is selected, Backlight is switched off and Contrast level is set to 50%.

Use System Reset as the first command after installation. Also use System Reset if for any reason the Program EPROM has been replaced.

Screen Editing.

The EDIT function allows the user to remove unwanted elements from the screens. It is also possible to modify the Unit of Measure for a single screen element. Consult the various screen descriptions in Section 4 to get a detailed reference to all single screen elements for each screen.

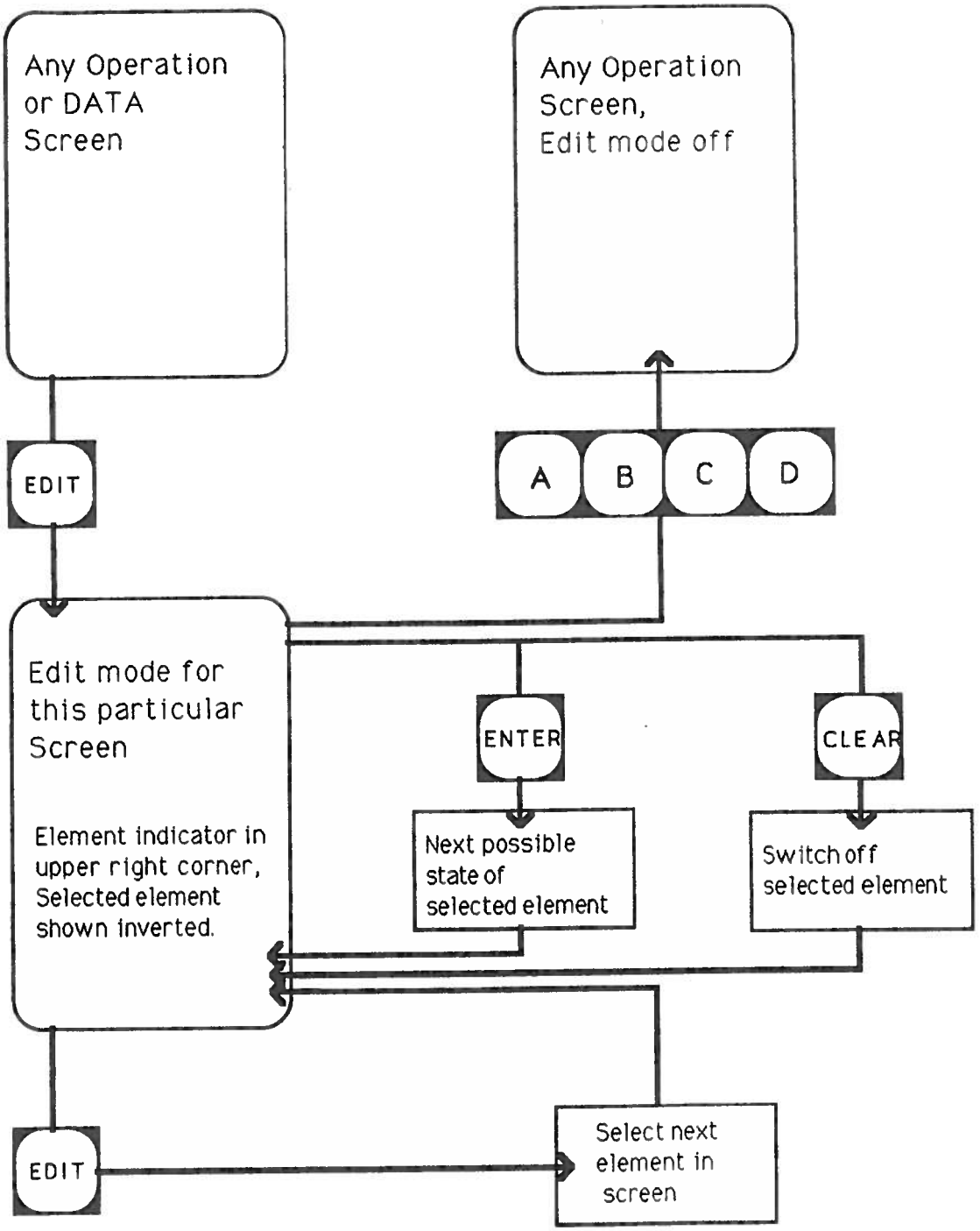


Fig. 3.2 Screen Editing Flowchart

4. Operation

When the installation is complete, and power is connected to the Display Unit, the unit is swiched on by pressing any button. The unit is switched off by pressing the "OFF" button.

Operation Screens

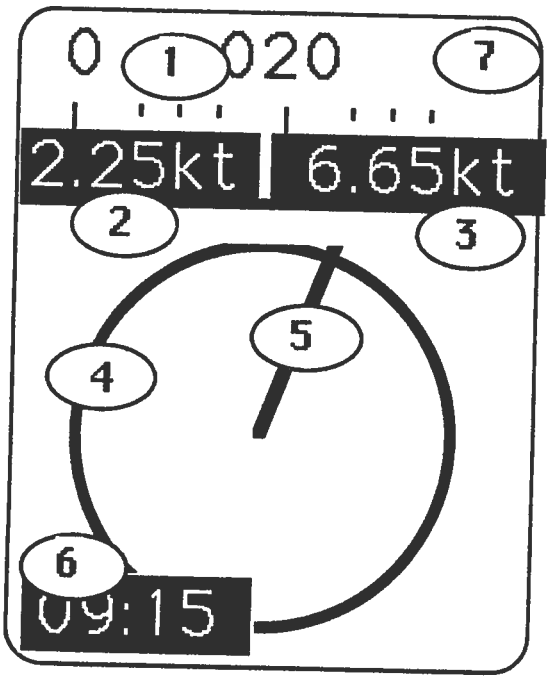
Each of the operation screens contains a selection of the available information. The user decides which screen he wants by pressing one of the buttons A, B, C or D. The screen layouts are outlined in Fig. 4.1 through 4.4.

Screen A. Fig. 4.1, shows digital longitudinal and transversal speed as well as graphic and numeric representation of the drift angle.

Screen B, Fig. 4.2, contains large digital indicators for longitudinal and transversal speed, including arrows for direction indication.

Screen C, Fig. 4.3, contains all measured and calculated values in digital form.

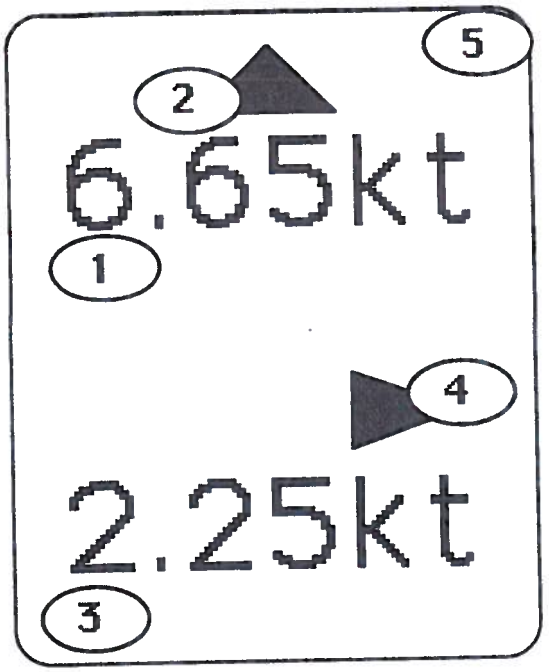
Screen D, Fig. 4.4, shows the distance logs.



Screen elements

No.	Element Contents
1	Drift angle assembly
2	Transversal speed
3	Longitudinal speed
4	Circle
5	Drift angle vector
6	Clock
7	Element counter

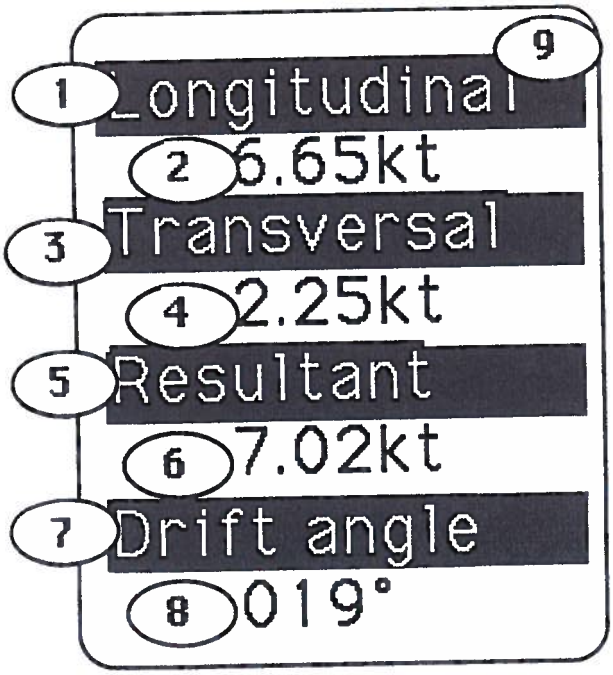
Fig. 4.1 **Operation Screen A**



Screen elements

No.	Element Contents
1	Longitudinal Speed
2	Long. Direction Arrows
3	Trans. Direction Arrows
4	Transversal Speed
5	Element counter

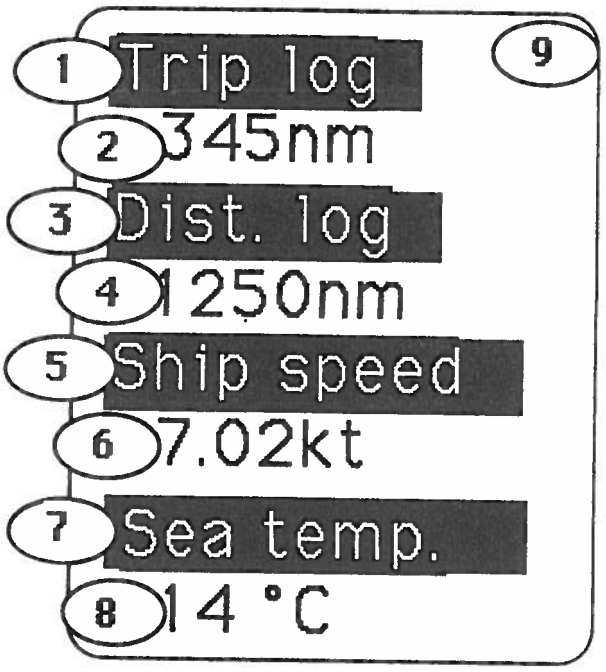
Fig. 4.2 **Operation Screen B**



Screen elements

No.	Element Contents
1	"Longitudinal" text
2	Longitudinal Speed
3	"Transversal" text
4	Transversal Speed
5	"Resultant" text
6	Resultant Speed
7	"Drift Angle" text
8	Drift Angle
9	Element counter

Fig. 4.3 **Operation Screen C**

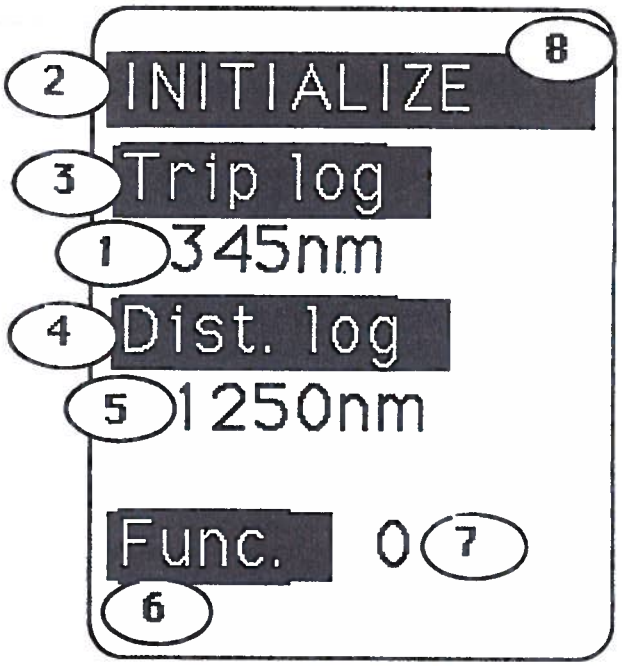


Screen elements

No.	Element Contents
1	"Trip Log" text
2	Trip Log
3	"Dist. Log" text
4	Distance/Sum Log
5	"Ship Speed" text
6	Resultant Speed
7	"Sea Temp." text
8	Sea Temperature
9	Element counter

Fig. 4.4 **Operation Screen D**

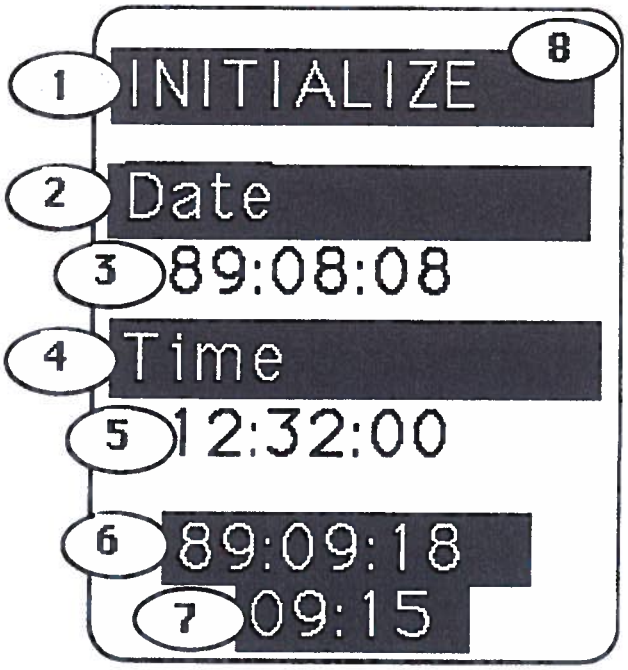
DATA Screens.



Screen elements

No.	Element Contents
1	Trip Log Entry
2	"INITIALIZE" text
3	"Trip Log" text
4	"Dist. Log" text
5	Distance/Sum Log Entry
6	"Func." text
7	Function Code Entry
8	Element counter

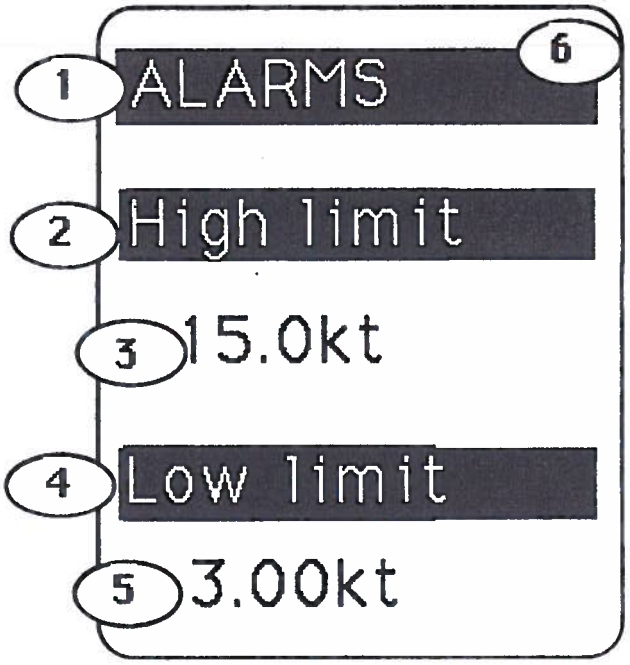
Fig. 4.5 **DATA Screen D1**



Screen elements

No.	Element Contents
1	"INITIALIZE" text
2	"Date" text
3	Date Entry
4	"Time" text
5	Time Entry
6	Current Date
7	Current Time
8	Element counter

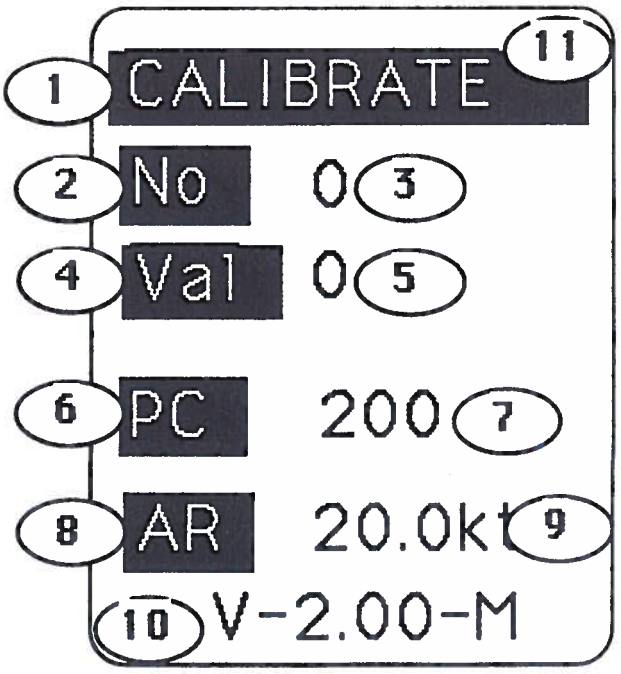
Fig. 4.6 **DATA Screen D2**



Screen elements

No.	Element Contents
1	"ALARMS" text
2	"High limit" text
3	High Limit Entry
4	"Low limit" text
5	Low Limit Entry
6	Element counter

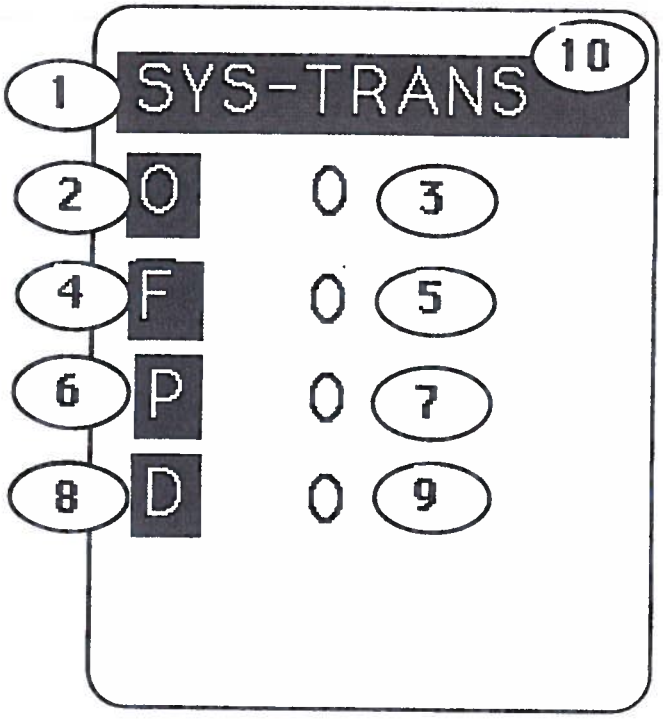
Fig. 4.7 DATA Screen D3



Screen elements

No.	Element Contents
1	"CALIBRATE" text
2	"No" text
3	Parameter Number Entry
4	"Val" text
5	Parameter Value Entry
6	"PC" text
7	Pulse Count/Nm Entry
8	"AR" text
9	Analogue Range Entry
10	Software V(ersion)-No-M(aster)/S(lave) setting
11	Element counter

Fig. 4.8 DATA Screen D4



Screen elements

No.	Element Contents
1	"SYS-TRANS" text
2	"O" text
3	Data Overflow Indicator
4	"F" text
5	Data Framing Indicator
6	"P" text
7	Data Parity Indicator
8	"D" text
9	Data Indicator
10	Element counter

Fig. 4.9 **DATA Screen C1**

Repeater Programming.

The repeater unit EMR224 does not have the numeric keyboard installed. In order to access all programming functions in an EMR224, the repeater must be connected to an EML224 Keyboard via the KEYB+ and KEYB- terminals, or to a separate programming keyboard. See Fig. 2.8.

Distance/Trip Log.

The Distance- and Trip logs are operated from DATA Screen D1. The system includes two distance logs. One is meant as a totalizer, the other as a trip log. Both logs may be initialized to any value. If the Distance log is set to a value lower than the last value saved in EEPROM, an alarm will sound, and the operator may correct the last setting if required.
The trip log, however, may be reset to Zero also from the Operation Screen D by pressing CLEAR. See Fig. 4.5.

Contrast & Backlight adjustment

Contrast and backlight may be continuously controlled by means of the "Up"/"Down" pushbuttons. By keeping one of the arrow buttons pressed, the corresponding value will increase or decrease until a satisfactory setting is obtained and the button released. The settings are maintained in the non-volatile memory, and the last settings are restored on power up.

The Backlight panel may not come on until the level set is well above 50%. Once the light panel is on, however, the level may be decreased to any desired setting.

Alarm settings

Speed alarm settings are performed from DATA screen D3. Alarm limits are referred to the resultant speed, positive values indicate AHEAD, negative values ASTERN. Alarms are removed by entering 0 as a value, and therefore 0 cannot be used as an alarm limit. An active high alarm limit must be greater than an active low alarm limit. Apart from this, limits may be positive (denoting AHEAD) or negative (denoting ASTERN). Alarm limits are enforced with a 10% dead band.
The alarm system is disabled while the DATA screen D3 is active to avoid unwanted alarms while entering values. See Fig. 4.7.

Clock setting

Clock and Calendar adjustment is carried out in DATA screen D2. Dates are entered in the format **yymmdd**, times in 24 hr. format as **hhmm00**. The calendar must be corrected at leap years.
The clock display may be EDIT-ed to show hours:minutes, hours:minutes:seconds or decimal hours. See Fig. 4.6.

Non-volatile memory.

The system contains non-volatile memory to maintain Distance logs and user settings like Screen selection, Language and unit selection, Contrast and Backlight settings etc.
All non-volatile memory information is kept both in a battery backed primary RAM and in a back-up EEPROM. The RAM is copied to the EEPROM regularly or may be forced by a Function code. On power-up, the RAM content is normally used unless it is found to be corrupt, in which case the EEPROM content is used. Reading of the EEPROM may also be forced manually with a Function code.

Sensor maintenance.

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 transducer. The sensor has no moving parts.

Display unit maintenance.

The display 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.

6. Specifications

Display texts:

English	Norwegian	Spanish	French
Longitudinal	Langskips	Longitudinal	Longitudinal
Transversal	Tverrskips	Transversal	Transversal
Resultant	Resultant	Resultante	Resultant
Ship speed	Båthastighet	Vel. barco	Vit. bateau
Drift angle	Avdr. vinkel	Angulo deriva	Angle derive
Dist. log	Dist. logg	Dist. corred.	Distance loch
Trip log	Trip teller	Viaj. corred.	Voyage loch
CALIBRATE	KALIBRERING	CALIBRAR	CALIBRER
Func.	Funk.	Func.	Func.
INITIALIZE	STARTVERDI	INICIO	INITIATION
No	Nr	No	No
Val	Ver	Val	Val
Version X.X	Versjon X.X	Version X.X	Version X.X
ALARMS	ALARMER	ALARMAS	ALARMES
High limit	Høy grense	Limite alto	Seuil haute
Low limit	Lav grense	Limite bajo	Seuil basse
Sea temp.	Sjø temp.	Temp. mar	Temp. eau
Date	Dato	Fecha	Date
Time	Tid	Hora	Heure

Units of measure:

English	Norwegian	Spanish	French	
m	m	m	m	(meters)
km	km	km	km	(kilometres)
nm	nm	mn	mn	(nautical miles)
mls	mls	mls	mls	(miles)
ms	ms	ms	ms	(meters per second)
kt	kt	nd	nd	(knots)
kh	kh	kh	kh	(kilometres per hour)
mh	mh	mh	mh	(miles per hour)
°K	°K	°K	°K	(degrees Kelvin)
°C	°C	°C	°C	(degrees Celsius)
°F	°F	°F	°F	(degrees Fahrenheit)

Dimensions

Hull Fitting with ball valve:	Height	450 mm
	Diam. bottom	185 mm
	Diam. top	165 mm
Sensor	Height incl. plug	440 mm
	Height excl. plug	288 mm
	Diameter housing	60 mm
	Diameter flange	165 mm
Sensor Junction Box	Front panel	144 x 144 mm
	Size incl. glands	144 x 155 mm
	Depth	67 mm
Display unit	Height, front	159 mm
	Height incl. bracket	184 mm
	Width	249 mm
	Depth	110 mm
Display unit, Cut-out for flush mounting	H x W	142 x 233 mm

Performance

Speed Range:	-30 - +30 kts
Accuracy, Speed:	0,3%, 3 - 30 kts
	0,01 kts, 0-3 kts
Resolution, Speed:	<10kts: 0,01 kts
	≥10kts: 0.1kts
Resolution, Temperature	0,1 °C
Resolution, Distance:	0,001 nm

Environmental

Sensor and Junction Box

Supply voltage:	220V or 110V AC, (24V DC optional)
Supply voltage:	10W at 220/110V AC
Operating temperature	0 - 55°C
Storage temperature:	-20 - 70°C
Protection, Sensor tip:	6 bar
Protection, parts inside hull:	IP66

Display Unit

Supply voltage:	220V or 110VAC, 24VDC (16-36V)
Supply voltage:	3W at 24V, 6W at 220V
Pulse interface:	Reed contact, max 10V, 10 mA
Alarm relay:	Change-over contact, max 24V 300 mA
Current serial port:	20 mA current loop asyncronous. Opto-coupler at input.
NMEA port:	5-9V/20 mA async. Opto-coupler at input.
Operating temperature:	0 - 55 °C
Storage temperature:	-20 - +70 °C
Humidity:	10 - 96% relative, no condensation.

7. Service

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