

RIVERTRACE ENGINEERING LTD



**109080
INSTRUCTION MANUAL
BILGE OIL ALARM**

SMART CELL-BILGE

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Section 1

Introduction

1.1 Important Notes

- All National or local codes of practice or regulations must be observed and, where applicable, are deemed to take precedence over any directive or information contained in this manual.
- This equipment must be installed and operated in strict accordance with the instructions contained in this manual. Failure to do so will impair the protection provided.
- Installation and retro fitting of parts listed in **Section 5.3** must be undertaken by a competent and suitably skilled person.
- Servicing, other than replacement of spares, must be undertaken by an RTE approved service centre.
- The equipment must be provided with a sound electrical earth connection.
- The unit must be isolated from the electrical supply before any maintenance of the equipment is attempted.
- Hazardous voltages are present within the monitor enclosure and solenoid valve assembly.
- It is essential that maintenance is carried out as described in **Section 5**. Failure to do this will impair the functionality of the equipment and could lead to permanent damage to the monitor.
- **The SMART CELL enclosure must not be opened. If opened a cell breach error will be displayed on the screen (this error cannot be reset) and the "VOID" tamper proof labels on either side of the enclosure lid will be destroyed. Forcing the throttle to its extents will also damage the cell and if unscrewed will distort the cell lid thereby causing a cell breach error.**



1.2 SMART CELL - BILGE Overview

The SMART CELL - BILGE Monitor has been designed specifically for use in conjunction with 15ppm oily-water separator units. It has a specification and performance which meets the requirements of the International Maritime Organisation specifications for Bilge Alarm Units contained in Resolution MEPC 107 (49).

Analysis of the oily water sample is undertaken by a unique detector array arrangement. A narrow beam of light is emitted across a glass cell tube which the oily water sample passes through. Light scattered and transmitted is detected across the array and passed through a complex oil content calculation algorithm. The resulting oil content is then displayed on the LCD screen.

Two oil alarm relays and a 0-20mA / 4-20mA output are provided to control the overboard discharge and to view / record oil content levels remotely.

To meet the new requirements of MEPC 107(49) an on board flash memory, Real time clock, dual switch input and clean water / sample selection valve are fitted. These are described in more detail in the operating instructions (**Section 4**).

1.3 Specification Listing

Measurement

Oil types:	Fuel Oil, Diesel and Mixture C (IMO defined)
Clean water calibration:	+/- 2ppm of factory set values
Oil range:	0 - 30 ppm (trend to 40) all types
Resolution:	0.1 ppm
Accuracy oil + solids :	+/- 5ppm up to 30 ppm
Solids discrimination:	100ppm Iron Oxide in 10 ppm Diesel
Response time:	< 5 sec (oil reading)

Alarms

Oil alarm 1 setpoint:	1 – 15 ppm user adjustable
Oil alarm 2 setpoint:	1 - 15 ppm user adjustable
Oil alarm 1 delay:	0 – 5 seconds user adjustable (For Overboard Valve)
Oil alarm 2 delay:	0 – 600 seconds user adjustable in 10 sec increments (For Annunciation only)
Alarm hysteresis:	0.5 ppm
Alarm contacts:	2 SP Alarm Relays 10A @ 250VAC (NC in alarm)

User Interface

LCD display:	4 x 16 alphanumeric back lit LCD display
Control:	3 button keypad

Input / Output

Analogue output:	Loop powered 4-20mA / 0 - 20mA 24V
Communications:	RS232 - output
Cable terminals:	Accept cores of 2.5mm ² (HV) and 1.5mm ² (LV)
Cable glands:	4 x to accept cable diameters 10 – 14mm dia.
Switch inputs:	2 x switch inputs for separator & flow status

Data Storage and Retrieval

Calibration data storage:	Stored on board microcontroller in Smart Cell
IMO required data:	Stored in Control enclosure (SMART CELL may be changed with data remaining on board)
IMO required data retrieval:	Via LCD display or RS 232 communication link

Environmental & Sample

Ambient humidity:	90%RH Max @ 55°C
Ambient temperature:	0°C - +60°C
Sample / clean water temperature:	+1°C - +60°C
Sample / clean water flow rate:	0.5 - 4.0 litres / min
Sample / clean water pressure:	0.1 bar - 10 bar
Sample / clean water select:	3 way universal solenoid valve
Sample pipe fittings:	¼ inch BSPP
Inclination	25° in any plane from normal mounting

System and Supply

Supply voltage:	115 or 230V AC, 50 – 60Hz (24VAC available)
Supply voltage Consumption:	< 50 VA including solenoid valve
Supply voltage tolerance:	+/- 15%
Other supply tolerance:	+/- 10%
Projected life:	> 50,000 hrs
Protection class:	IP 65
Approvals:	EU MED (GL) + USCG to IMO MEPC 107(49)

Construction and other Criteria.

Security:	Protection of all calibration dependent items plus software lock
Auto clean (optional) :	User set 1 – 360 min (if fitted)
Manual clean:	Fitted as standard
Weight:	3.2 Kg

Factory Default Settings.

Alarm 1:	15 ppm
Alarm 1 delay period:	5 seconds
Alarm 2:	15 ppm
Alarm 2 delay period:	70 seconds
Current loop:	4-20mA
Autoclean:	Not set
Flowswitch:	Not set

Section 2

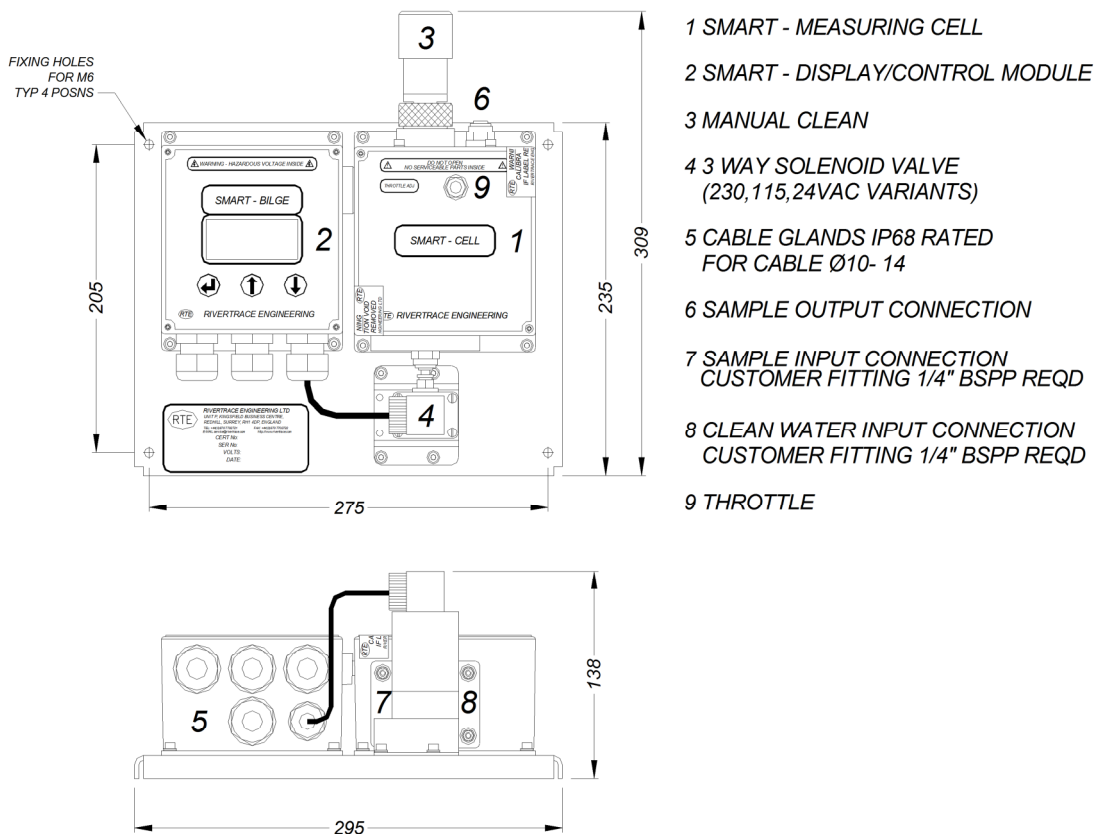
Installation

2.1 Construction Details

The SMART CELL - BILGE Monitor is split into two logical modules. The display / control module **(2)** (left) contains the membrane keypad, LCD display and the Smart Bilge Control PCB. Contained on this PCB are all the control and data storage associated electronics in addition to all the customer terminations which can be accessed via the cable glands**(5)**. This PCB links a 5 volt supply and RS485 communications to the Cell electronics via a 4 wire interface cable.

The SMART CELL **(1)**, contains the optoelectronics and mechanics used in the calculation of the sample oil content. **UNDER NO CIRCUMSTANCE IS THIS ENCLOSURE TO BE OPENED.** Sample **(7)** and clean water **(8)** lines are connected to the solenoid valve to allow automatic selection of clean water for clean water calibration and diagnostics. Sample/Clean water is exhausted from the monitor via the outlet **(6)** after passing through the measuring sensor. A manual cell clean unit **(3)** is provided which must be used in accordance with the maintenance requirements in **Section 5**. The throttle **(9)** can be used to increase or decrease the back pressure in the cell. This is especially useful if air is present in the sample.

Fig 2.1
Construction details



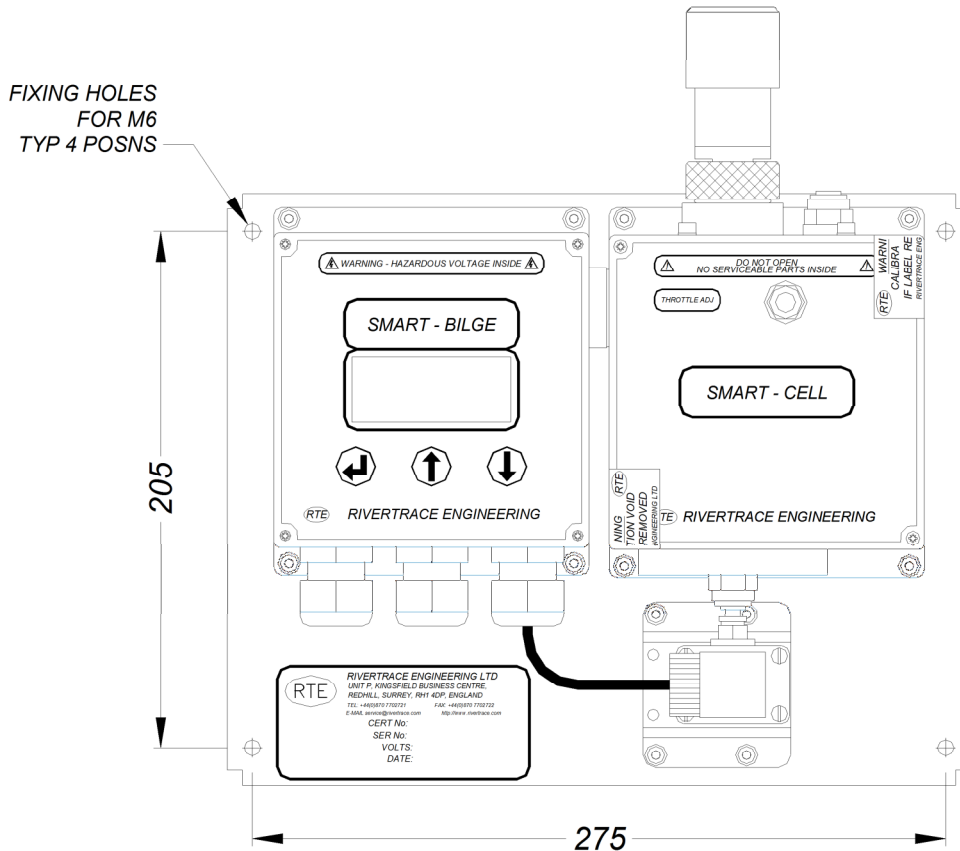
2.2 Mounting Details

The SMART CELL - BILGE monitor should be located on or in close proximity to the oily-water separator to minimise response delays. Under no circumstances should the distance between the monitor and the separator exceed a distance that would result in a response time of more than 20 seconds and breaching IMO regulations.

Mounting

Mount the SMART CELL - BILGE by means of 4 x M6 bolts on to a rigid vertical surface and preferably with the display panel of the monitor at operator eye level.

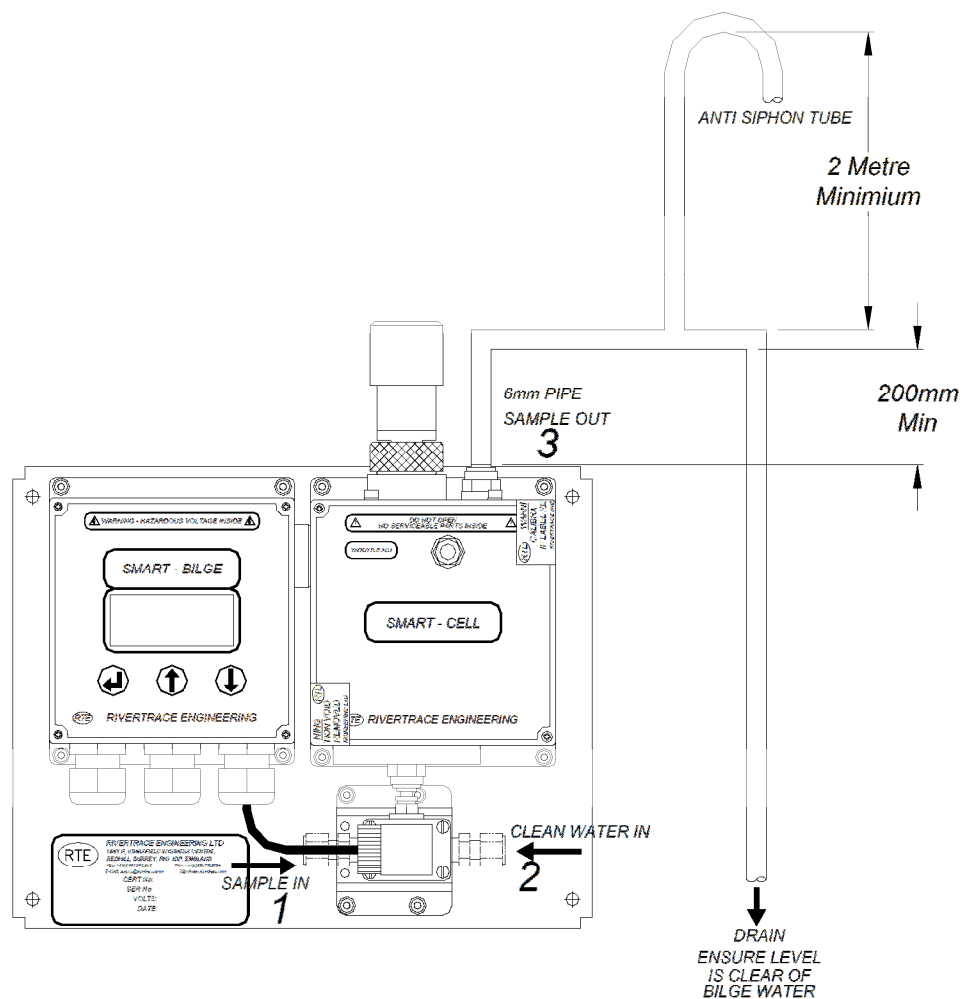
Fig 2.2
Mounting Details



2.3 Pipe Work and Connections

Fig 2.3 Shows all pipe fittings required for Sample In, Clean Water In and Sample Out. All inlet connections are 1/4"BSPP. The outlet from the measuring cell is a 6mm OD push in fitting. The monitor is shipped with an adaptor that can change the outlet from 6mm OD push-in to either 6mm pipe compression fitting or 1/4" BSPP. You should ensure that the pipework between the separator sample point and the monitor is a single pipe and does not contain any isolation valves. You can use either 6 or 8mm pipework and 10mm pipework if the pipe length between the separator sample point and the monitor is no more than 2 metres.

Fig 2.3
Pipe Fittings



Item No.	Description
1	Sample Inlet 1/4 inch BSPP fitting
2	Clean Water Inlet 1/4 inch BSPP fitting
3	Sample Outlet 1/4 inch BSPP fitting

2.4 Electrical Connections

WARNING: Hazardous voltages are present in the control enclosure – Ensure equipment is isolated before proceeding.

Please read the following points before attempting any electrical work.

- Ensure all cabling is volt free and isolated.
- This unit must be connected to the mains supply via a suitably rated double pole (3mm contact gap), 2 Amp fused, isolator unless such fusing/isolation is provided by associated equipment. Isolator should be clearly marked as to function.
- Cable gland entries can accept cables from 10 to 14 mm diameter and terminal blocks will accept cable cores of 2.5mm² (mains / Alarm contacts) and 1.5 mm² (terminals less than 48 V) . Cables carrying hazardous voltages must be at least 0.5 mm² csa.
- When terminating mains cabling at monitor and electrical source, the earth conductor must be made longer than the live and neutral conductors.

User terminations are located by removing the lid from the SMART Display/Control module via the four screws. A protection plate is situated above the terminals which must be removed via 4 M3 screws.

Fig 2.4.1
User Terminations

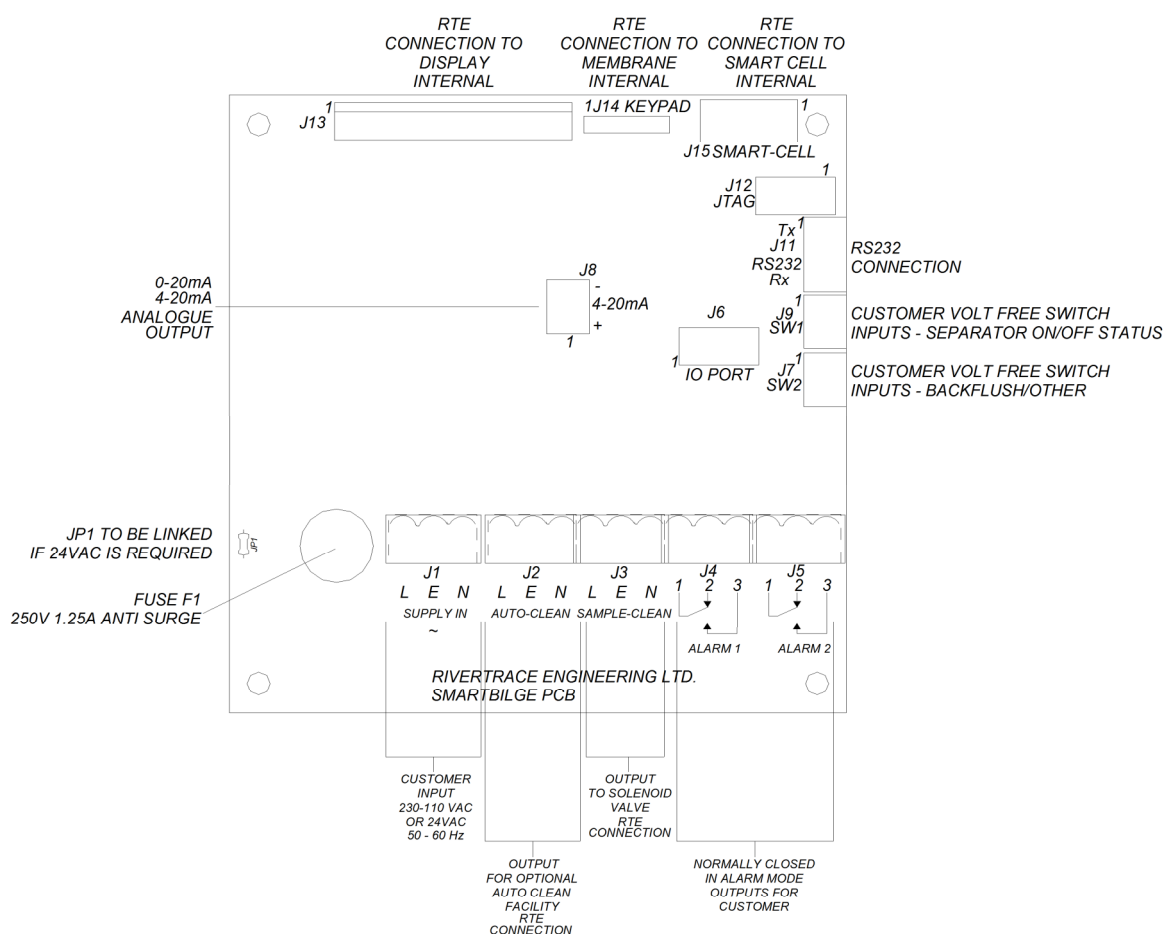


Table 2.4.2
User Terminal Connections

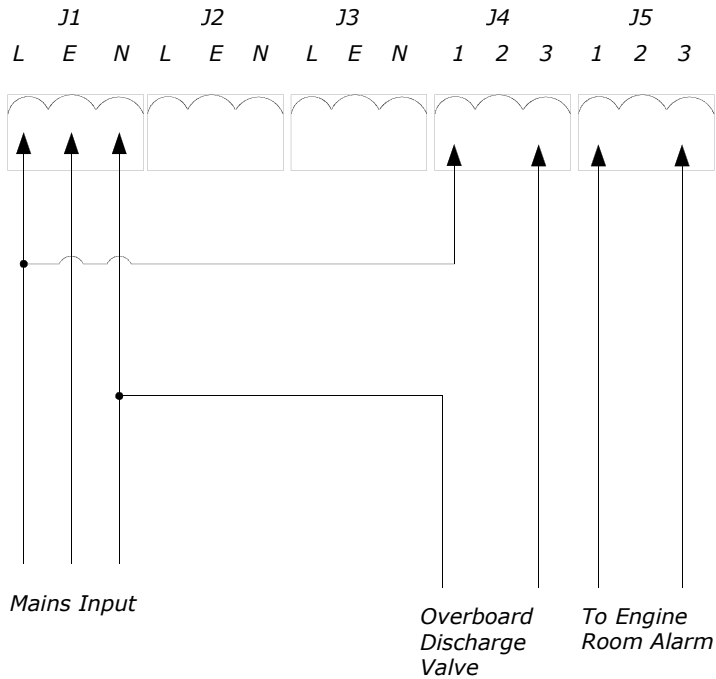
Terminal	Terminal description	Terminal block description	Max ratings
J1 - L	Live in 24/115/230 V AC	Customer Supply Mains input from suitably rated Isolator	250V AC, 40 VA max.
J1 - E	Earth		
J1 - N	Neutral in 24/115/230 V AC		
J2 - L	Live 24/115/230 V AC	Auto clean control. Note: wiring (if present) to this terminal is not to be altered.	250V AC , 500mA.
J2 - E	Earth		
J2 - N	Neutral 24/115/230 V AC		
J3 - L	Live 24/115/230 V AC	Sample clean control. Note: wiring to this terminal is not to be altered.	250V AC, 500mA.
J3 - E	Earth		
J3 - N	Neutral 24/115/230 V AC		
J4 - 1	Common	Alarm 1 relay contacts, normally closed in power down and alarm active states. (Overboard Valve Control)	250V AC/DC, 10A.
J4 - 2	Normally closed contact		
J4 - 3	Normally open contact		
J5 - 1	Common	Alarm 2 relay contacts, normally closed in power down and alarm active states. (Alarm Annunciation Only)	250V AC/DC, 10A.
J5 - 2	Normally closed contact		
J5 - 3	Normally open contact		
J7 - 1	5V DC from PCB	Back-flush Switch Input 2	5V DC 20mA
J7 - 2	Switch In		
J8 - 1	+24V DC	4-20mA Connection 0-20mA Connection	24V DC 20mA
J8 - 2	0V		
J9 - 1	5V DC from PCB	Separator Status Switch Input 1	5V DC 20mA
J9 - 2	Switch In		
J11 - 1	Tx	RS232 Connection	+/-12V DC 10mA
J11 - 2	GND		
J11 - 3	Rx		

Precise wiring details will vary dependent upon the control system to be employed but Alarm relay 1 must be used for control of the overboard discharge valve and Alarm relay 2 for alarm annunciation only. The separator status switch input should be connected to a suitable volt-free contact in the separator. A separate screened cable should be used for this connection.

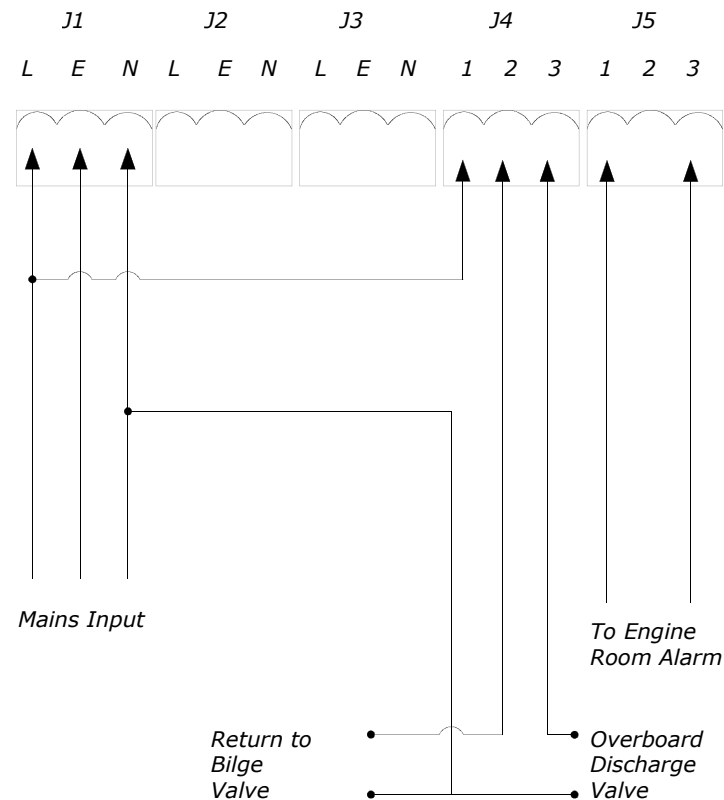
Fig 2.4.3
User Wiring Connections

Smart Bilge Electrical Connections

(provided supply voltage is the same for both Smart Bilge and Overboard Discharge valve)

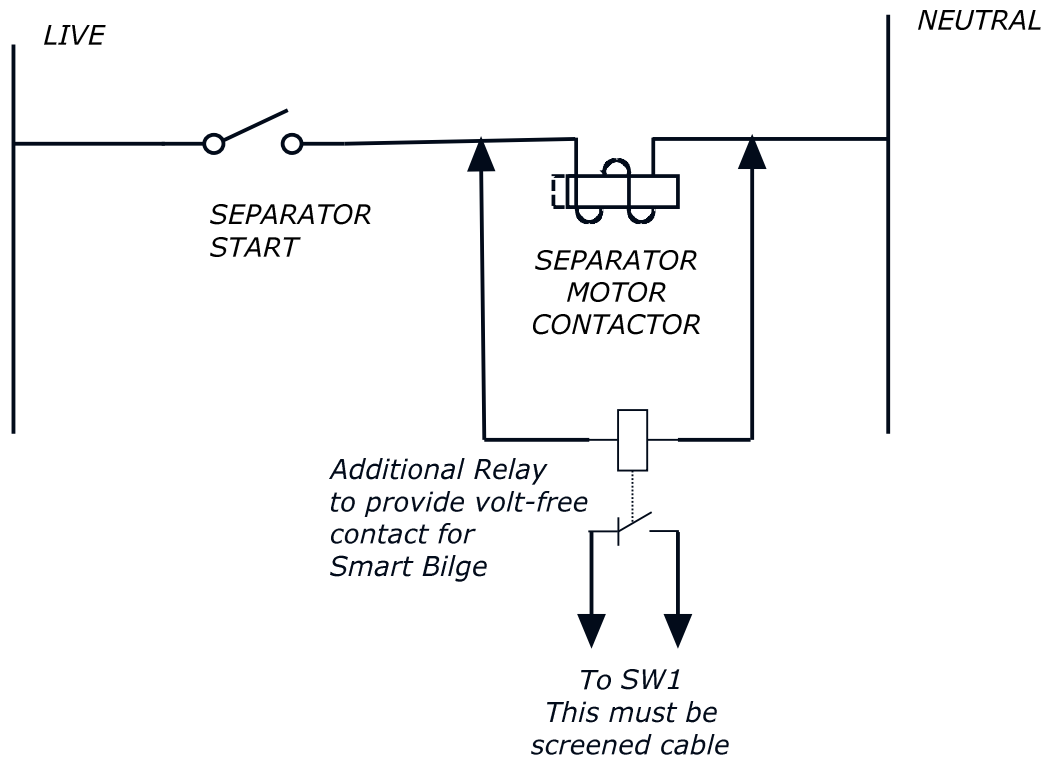


Smart Bilge Electrical Connections
(if there is a separate discharge and return to bilge valve)



Smart Bilge Electrical connection for separator status switch

VOLTAGE SUPPLY
 SUITABLE FOR
 OVERBOARD
 DISCHARGE VALVE
 SOLENOID



If the separator does not have a "Separator Status" volt-free contact then a suitable volt-free contact will have to be wired in parallel with the motor contactor for the separator pump. In all cases the wiring between the volt-free contact and the separator status input SW1 on the bilge monitor should be a screened cable.

Section 3

Commissioning

3.1 Piping

- Check all piping for leaks and rectify where appropriate
- Ensure all piping and fittings conform to specifications set in **Section 2.3**.

3.2 Electrical

- Check that correctly rated isolator is connected to the mains input (**see Section 2.4**).
- Check the SMART CELL - BILGE is correctly earthed.
- Check all cabling conforms to specifications set out in **Table 2.4.2**

3.3 Functional testing

- Follow **section 4** to start up and run clean water calibration.
- Follow **section 6** for trouble shooting should any errors/spurious readings result.

3.4 Throttle

The throttle is used to regulate the flow through the measuring cell and to provide backpressure to decrease any aeration in the sample flowing from the separator.

The throttle should not be forced beyond its end stops – if rotated clockwise beyond its stop it is possible to strip its thread thereby causing the cell to leak. If the throttle is rotated anticlockwise beyond its stop then it is possible to distort the cell case lid which in turn will activate a cell breach error. This will require intervention by RTE

- **IF you experience fluctuating ppm readings then firstly try rotating the throttle clockwise to increase the backpressure. Monitor the flow from the cell. You should ensure that at the flow rate does not fall below 0.5 litres/min.**

Section 4

Operating instructions

4.1 Getting Started

The SMART CELL - BILGE is controlled and set up by the user interface on the Display/Control Module. Use the diagram in **Fig 4.1.1** to become familiar with the controls,

Fig 4.1.1
User interface

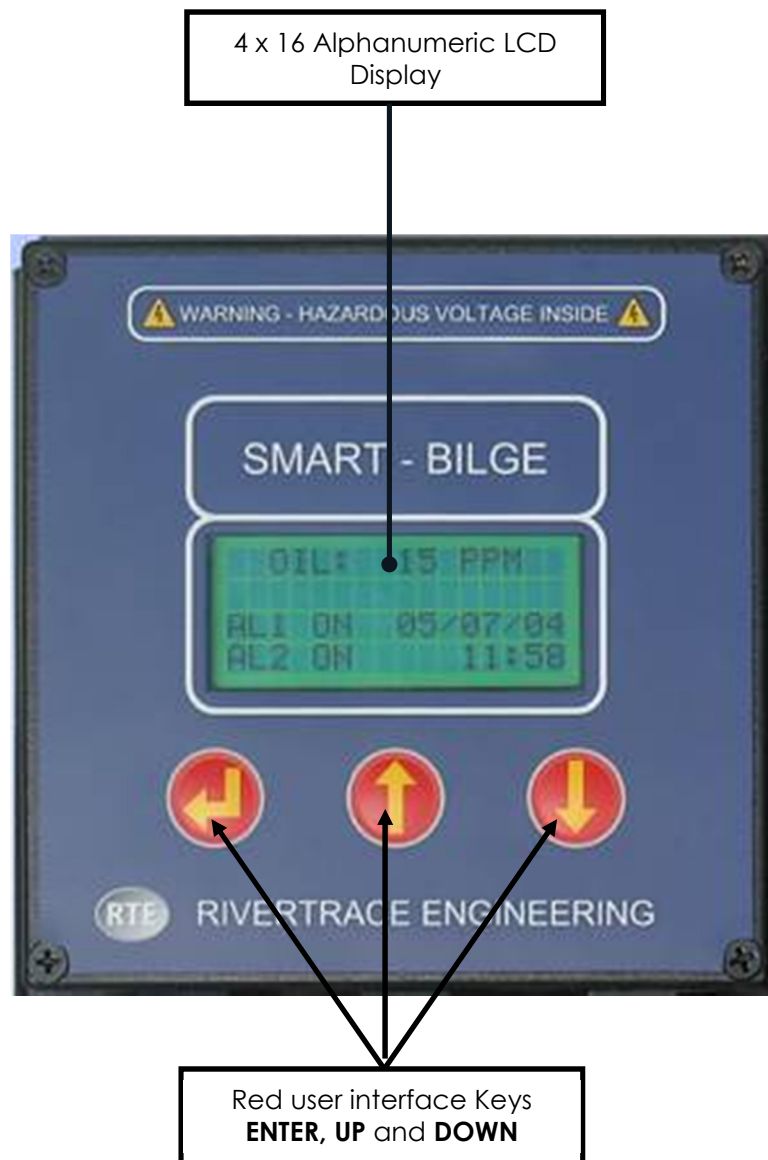


Fig 4.1.2
Screen Shot – Start Screen

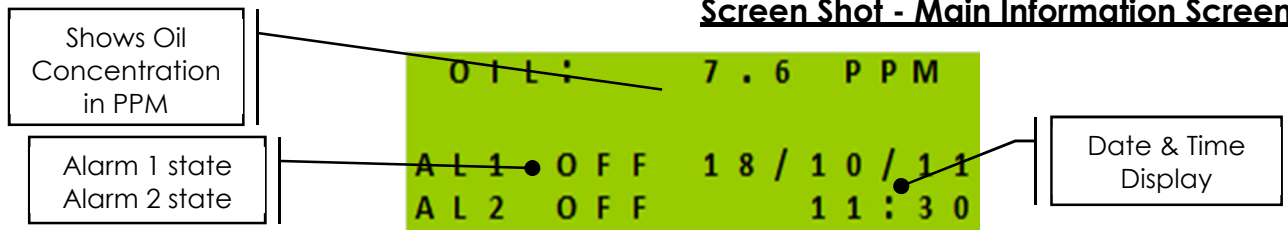
```
*  I N I T I A L I S I N G  *
P l e a s e  W a i t . . .
                      1 2
```

On power up the user will be presented with a screen as shown in Fig 4.1.2 which shows that the monitor is in its start up sequence. The screen will show "Initialising" and will show a counter that will decrement from 20 seconds to 0 seconds before changing to the Main Information screen. During this period the alarms will be activated.

After initialisation the user will be presented with a screen as shown in **Fig 4.1.3**.

- At the top of the display the user will see the oil concentration in Parts Per Million (PPM).
- The status of the two oil alarms will be displayed.
- The date and time is displayed. (Time is set to GMT/UTC and can only be adjusted by RTE approved engineer).
- If either of the alarm set points is passed the LCD backlight will flash.

Fig 4.1.3
Screen Shot - Main Information Screen



To interrogate the SMART CELL - BILGE Monitor settings the user can press any of the Interface Keys which brings up the Menu Options Screen as shown in **Fig 4.1.4**

Fig 4.1.4
Screen Shot - Menu Screen Options

```
> E s c a p e
C l e a n  w t r  c a l
S e t   a l r m  p o i n t
S e t   a l r m  d e l a y
```

```
> S e t   a n a l o g  o u t
V i e w  I M O  d a t a
D i a g n o s t i c s
A u t o c l e a n
```

```
> V e r i f y  C a l i b
```

Use the **DOWN** and **UP** Keys to view all the Menu options. Press **ENTER** on any option to select or on **Escape** to return to main information screen.

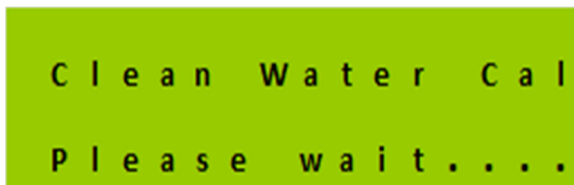
4.2 Clean Water Calibration

A clean water calibration can be performed to account for differences in clean water between the factory calibrated clean water and the ships own clean water supply. On activation of the clean water calibration the clean water / sample solenoid will select clean water. The SMART CELL - BILGE will then average the clean water reading over the period of 30 seconds after which a further 10 seconds will lapse for the user to verify the calibration in monitor mode before the solenoid selects sample once more.

To set the clean water calibration enter the Menu screen as shown in **Fig. 4.1.3** and scroll down until the cursor reaches "**Clean wtr cal**" then press the **ENTER** key. The screen will change as shown in **Fig 4.2.2**

Fig 4.2.2

Screen Shot - Menu Screen Options



The screen will display for **30 seconds** after which, it will return to that shown in **Fig 4.1.3**. The solenoid will select clean water for a further 10 seconds so that the clean water reading can be verified by the operator.

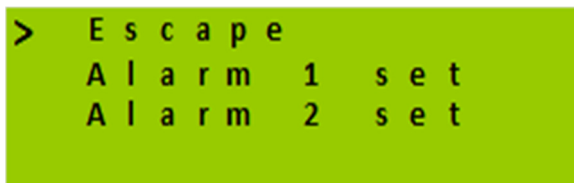
4.3 Set Alarm Points

The SMART CELL - BILGE Monitor has two independent oil alarm contacts for user termination. These can be set by the user to operate when the displayed Oil content reaches the required Parts per Million (PPM) settings.

Note: The alarms have a 0.5 ppm hysteresis included to prevent relay chatter. e.g if an alarm is set at 15 ppm and the oil concentration exceeds 15 ppm, the alarm will be activated. The alarm will not deactivate until the oil concentration drops below 14.5 ppm.

To set the required Alarm points enter the Menu screen as shown in **Fig. 4.1.3** and scroll down until the cursor reaches "**Set alarm point**" then press the **ENTER** key. The screen will change as shown in **Fig 4.3.1**.

Fig 4.3.1
Screen Shot - Alarm Set Options

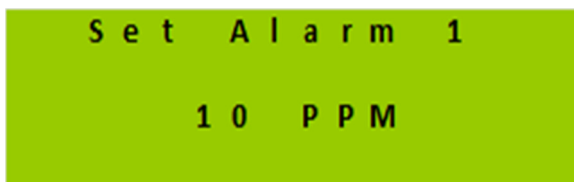


> E s c a p e
A l a r m 1 s e t
A l a r m 2 s e t

Move the cursor to Alarm 1 set by pressing the **DOWN** key and then press **ENTER**. This will bring up the screen as shown in **Fig 4.3.2**.

Note: Alarm 1 MUST be used for control of the overboard discharge valve.

Fig 4.3.2
Screen Shot - Alarm PPM Value



S e t A l a r m 1

1 0 P P M

The PPM value can now be set. The range is between **1 & 15**. Use the **UP** or **DOWN** key to select the required value. Once the required value has been selected press the **ENTER** key. This will bring the screen back to **Fig 4.3.1**. Repeat this operation to set the value for alarm 2. Press the **ENTER** key 3 times to return to the main information screen as shown in **Fig 4.1.2**.

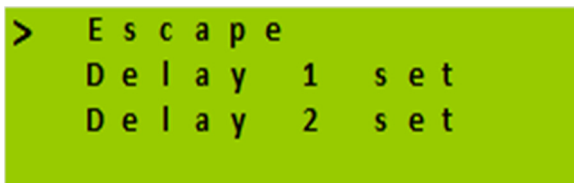
4.4 Set Alarm Delays

Once the alarm points have been set as described in **Section 4.3**, the alarm delay values can be entered. The alarm delay can be used so that if the oil concentration rises above the oil alarm set point for a period exceeding the alarm delay value the alarm relay will activate and only de-activate once the Oil Concentration has fallen below the Alarm Set Point.

Note: The main information display screen will show if an oil alarm is less or more than the current oil reading regardless of the alarm delay.

To set the required alarm delays go the menu screen as shown in **Fig. 4.1.3** and scroll down until the "**Set alarm delay**" then press the **ENTER** key. The screen will change as shown in **Fig 4.4.1**

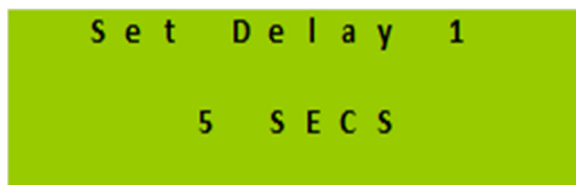
Fig 4.4.1
Screen Shot - Alarm Delay Options



```
>  E s c a p e
   D e l a y  1  s e t
   D e l a y  2  s e t
```

Move the cursor to delay 1 Set by pressing the **DOWN** key and then press **ENTER**. This will bring up the screen as shown in **Fig 4.4.2**.

Fig 4.4.2
Screen Shot - Alarm Set Delay Value

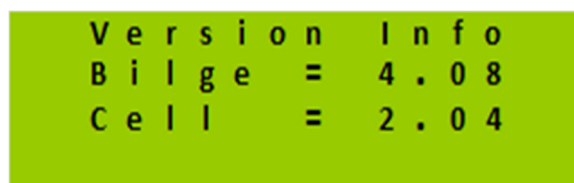


```
S e t   D e l a y   1
                    5   S E C S
```

Alarm delay 1 value can now be set between **0 & 5 Seconds**. Use the **UP** or **DOWN** key to select the required value. Once the required value has been selected press the **ENTER** key, this will bring the screen back to **Fig 4.4.1**. Repeat this operation to set the value for delay 2 (range between **0 & 600 Seconds** in **10 second increments**).

Press the **ENTER** key 3 times to return to the main information screen as shown in **Fig 4.1.2**.

Fig 4.4.3
Screen Shot – Version Info



```
V e r s i o n   I n f o
B i l g e   =   4 . 0 8
C e l l     =   2 . 0 4
```

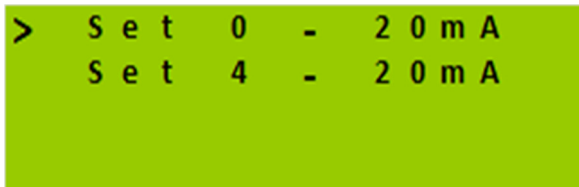
The Version Info can be used to view the software version fitted to the Smart Bilge monitor, it will show both the software version for the microcontroller module and the measuring cell module.

4.5 Set Analogue Out

The analogue signal output can be set to either **0 – 20 mA** or **4 - 20 mA** and is scaled from 0 to 30 ppm calculated oil concentration. To set the required analogue signal output go to the menu screen as shown in **Fig. 4.1.3** and scroll down until the "**Set analog out**" then press the **ENTER** key. The screen will change as shown in **Fig 4.5.1**.

Fig 4.5.1

Screen Shot - Analogue Output Options



```
>  S e t  0  -  2 0 m A
    S e t  4  -  2 0 m A
```

Move the cursor using the **UP** or **DOWN** key to select required option. Press the **ENTER** key twice to return to the main information screen as shown in **Fig 4.1.2**.

4.6 View IMO Data

It is required that the date, time, bilge alarm status and separator status is to be recorded for any change in alarm status or separator status and stored for a minimum of 18 months. This data is recorded within the Smart Control / Display enclosure, allowing replacement of the SMART CELL - BILGE whilst ensuring the data remains on board.

The separator status is recorded via the SW1 and SW2 inputs. The following configuration is used.

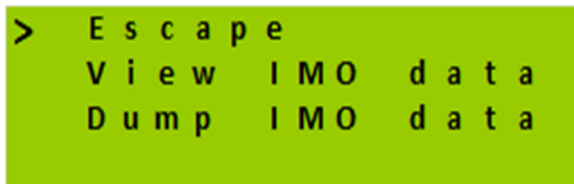
SW1 Separator ON/OFF status.
SW2 Separator Back-flush (If fitted)

Note. SW2 will select clean water and activate alarms permanently when closed. To be connected to Separator backflush control circuit via a potential free contact.

The configuration of the switches must be recorded on board and date stamped.

To view or download the IMO required data go to the Menu screen as shown in **Fig. 4.1.3** and move the cursor down until "**View IMO data**" then press the **ENTER** key. The screen will change as shown in **Fig 4.6.1**.

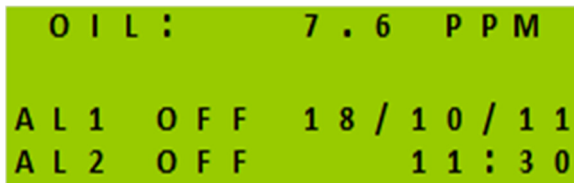
Fig 4.6.1
Screen Shot - View IMO Data



```
>  E s c a p e
   V i e w   I M O   d a t a
   D u m p   I M O   d a t a
```

Move the cursor to either View IMO data or Dump IMO data by pressing the **DOWN** key and then press **ENTER**. This will bring up a screen as shown in **Fig 4.6.2** or **Fig 4.6.3**.

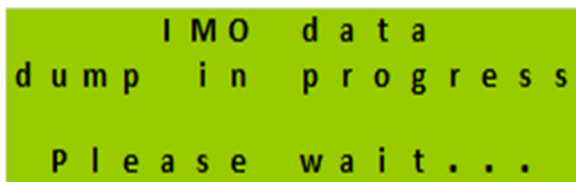
Fig 4.6.2
Screen Shot - IMO Data



```
  O I L :      7 . 6   P P M
A L 1   O F F   1 8 / 1 0 / 1 1
A L 2   O F F           1 1 : 3 0
```

This screen displays one IMO record at a time. Each record shows the oil content, Alarm status, switch input status and time/date of the record. The users can scroll through the records by pressing the **UP** and **DOWN** keys. When inspection is complete the **ENTER** key will exit the user

Fig 4.6.3
Screen Shot - Dump IMO Data



```
  I M O   d a t a
d u m p   i n   p r o g r e s s
P l e a s e   w a i t . . .
```

By selecting the dump IMO data command, the complete IMO required data history is copied and down loaded to the RS232 port. This can be captured by purchasing a Smart Bilge download cable with instructions from Rivertrace Eng, see **Section 5.4**. The download data screen will remain displayed until download is complete.

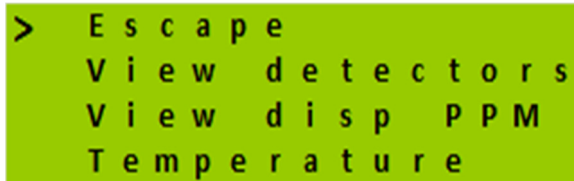
NOTE: Dump IMO data command will NOT erase any data

4.7 Diagnostics & Clean Water Flushing

To view the diagnostics go to the menu screen as shown in **Fig. 4.1.3** and scroll down until the "Diagnostics" then press the **ENTER** key. The screen will change as shown in **Fig 4.7.1**

Fig 4.7.1

Screen Shot - Diagnostics

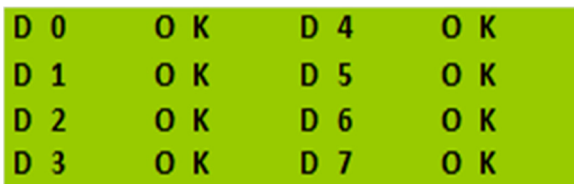


```
>  E s c a p e
   V i e w   d e t e c t o r s
   V i e w   d i s p   P P M
   T e m p e r a t u r e
```

Move the cursor to either View detectors or View disp PPM by pressing the **DOWN** key and then press **ENTER**. This will bring up a screen as shown in **Fig 4.7.2**, **Fig 4.7.3** or **Fig 4.7.4**

Fig 4.7.2

Screen Shot – View detectors

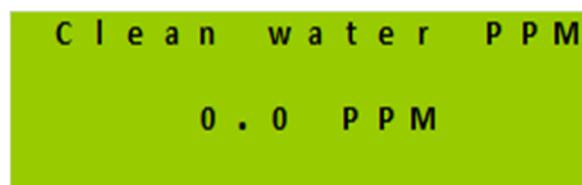


```
D 0      O K      D 4      O K
D 1      O K      D 5      O K
D 2      O K      D 6      O K
D 3      O K      D 7      O K
```

Once in view detectors, the solenoid valve will select clean water and the screen will display the current signals present for clean water. The alarm relays will activate when view detectors is selected. Pressing the **ENTER** key will leave the diagnostics screen and set the valve back to sample.

Fig 4.7.3

Screen Shot – View disp PPM



```
C l e a n   w a t e r   P P M
          0 . 0   P P M
```

Once in "view disp PPM", the solenoid valve will select clean water and the screen will display the current calculated ppm for clean water. The alarm relays will activate when view detectors is selected. Pressing the **ENTER** key will leave the diagnostics screen and set the valve back to sample.

Fig 4.7.4

Screen Shot – Temperature



```
F l o w   T e m p           2 8
```

Once in view Temperature, the temperatures shown is the flow temperature in deg Celsius. Pressing the **ENTER** key will leave the diagnostics screen and set the valve back to sample.

Clean Water Flushing

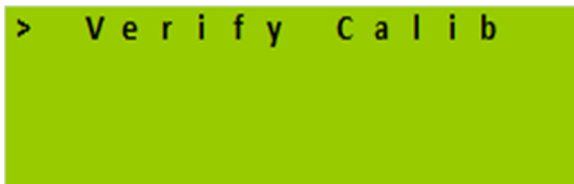
During "View disp PPM", the clean water valve is activated and clean water is allowed to flow through the monitor. The display will appear as per **Fig. 4.7.3** and the ppm reading of the clean water will be displayed. This reading should be less than 2 ppm. The manual clean plunger should be used at this time to clean the glass cell tube.

4.8 Test Procedure

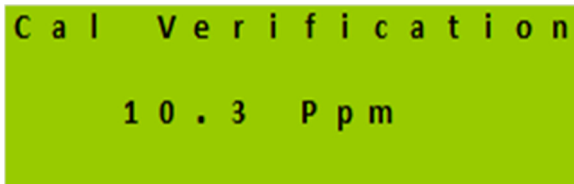
The following procedure is to be adopted to test the Smart Cell Bilge Monitor

1. Press and hold the Manualclean in the down position.
2. Confirm that both alarms are activated.
3. A plunger down error will be displayed.
4. Release the Manualclean.
5. The ppm figure on the LCD display will decrement from 40 towards zero.
This assumes that there is water flowing through the measuring cell.

4.9 Monitor Verification



> V e r i f y C a l i b



C a l V e r i f i c a t i o n
1 0 . 3 P p m

The monitor's calibration can be checked by using the Monitor Verification Water Sample Kit. This kit contains two bottles of verification fluid, one marked 10 ppm and the other 20 ppm. The user menu contains a sub menu – Verify Calib. Entering this menu allows the user to view the ppm value of the verification fluid being poured into the cell.

Procedure 109993 refers to the above.

Section 5

Maintenance and Spares

5.1 Weekly Maintenance

- Manual clean must be plunged and released 10 times.
- Carry out "Clean Water Calibration" as per **Section 4.2**
- Confirm Unit reads 0 ppm by following **Section 4.7**

5.2 Yearly Maintenance

At yearly intervals (or where necessary) the wiper ring on the manual clean assembly should be replaced. This can be ordered from RTE directly as part no. 109039.

To remove wiper assembly, electrically isolate the monitor. Have some rags available to wipe up any spills.

Ensure that the separator is switched off and there is no flow through the monitor cell.

Isolate clean water supply and remove manualclean by using the knurled cap to unscrew it. Pull the manualclean from the cell in a vertical motion and wipe with a rag. Locate the wiper and prise off with a small flat bladed screwdriver. Fit the new wiper by pushing it against a flat surface and rotating the manualclean at the same time.

Refit the manualclean into the cell and de-isolate power and water supplies.

IF required by your environmental or quality policy, it is possible to verify the accuracy of the monitor by purchasing a Calibration Verification kit. This can be purchased directly from Rivertrace or by one of our agents or service centres. If the calibration verification is carried out by one of our service centres then a Calibration Verification Certificate will be issued by them on behalf of Rivertrace.

5.3 5 Yearly Maintenance

Every IOPP Certificate Renewal Survey, (every 5 years): Cell should be verified/re-calibrated by an RTE approved service centre (contact RTE for an approved list) or a replacement calibrated cell can be requested from RTE (see below).

5.4 Spares

When ordering spares, it is important to supply details of the type of monitor, serial number of monitor, part number of each spare required, its description and any other relevant information.

RECOMMENDED ON-BOARD SPARES

Item	Qty	Part Number
Cell wiper ring	1	109039
Fuse 1.25A	1	109167

OTHER SPARES

Item	Qty	Part Number
Spare Smart Cell Assy Bilge	1	109171
Spare 110/240V Programmed Smart Bilge PCB Assy	1	110052
Spare 24V Programmed Smart Bilge PCB Assy	1	110053
Membrane overlay	1	109030
LCD display module	1	109068
Smart Bilge Download Cable	1	109165
Solenoid valve (230V)	1	109059
Solenoid valve (115V)	1	109060
Solenoid valve (24V)	1	109061
Calibration Verification Kit	1	109996

Section 6

Trouble Shooting Guide

6.1 Trouble Shooting Guide

Table 6.1
Trouble shooting guide

Symptoms	Possible Cause	Corrective Action
Monitor is switched on and the LCD screen is blank	Power is Isolated. Failure of mains fuse. Loose ribbon cable connection. LCD display Module is damaged.	Check Isolator Check fuse (F1). See fig 2.4.1 . Check all ribbon cable connectors are firmly inserted. Contact RTE for a replacement LCD module (Section 5.4)
Monitor stays in alarm or reading is inaccurate. Or Display shows SYS ERROR, Detector 0 – 7 Is under / over range. Or Display shows SYS ERROR, Oil content Is under / over range.	Dirty measuring cell. Excessive Contaminates present in sample e.g. rust bacteria, emulsified oils, detergents, discoloration of water. Measuring Cell is empty. Air bubbles are present in the Sample. Manual Clean has become stuck in the down position.	Clean cell and perform Clean water calibration. Section 5.1 Correct cause of contaminants and run clean water calibration. Check water flowrate through measuring cell is >0.5l/min. Turn throttle clockwise until air is removed from sample (taking care not to exceed the maximum operating pressure. Remove Manual clean unit and clean with a detergent. Check Wiper ring on the end of the piston and replace if necessary. If problems persist Contact RTE for a replacement Solenoid valve (Section 5.4).

Monitor ppm remains high and does not change	Measuring Cell is empty.	Check water flowrate through measuring cell is >0.5l/min.
Display shows Warning, flow Error detected **Only If flow switch fitted**	Flow through measuring cell not sufficient.	Increase flow through monitor cell, Remove pipework from sample inlet to solenoid and check that there is no debris blocking the port.
Display shows SYS ERROR, Temperature Is under / over range.	Current Ambient temperature inside the Cell is not within 0 - 60°C.	Move equipment to an area with ambient temp between 0 - 60°C.
Display shows SYS ERROR, Communications failure	RS 485 communications cable is loose / not connected Cell Electronics Fault.	Ensure 4-pin plug is tightly inserted into J15. Fig 2.4.1 Contact RTE for a replacement Cell (Section 5.3).
Display shows SYS ERROR, RTC – I2C failure	Smart Bilge electronics failure.	Contact RTE for a replacement Smart Bilge PCB (Section 5.4).
Display shows SYS ERROR, EEPROM Failure	Smart Bilge electronics failure.	Contact RTE for a replacement Smart Bilge PCB (Section 5.4).
Display shows SYS ERROR, Cell breach contact RTE	Measuring Cell has been opened or overuse of the throttle has damaged the cell.	Contact RTE for a replacement measuring cell (Section 5.4).
Display shows WARNING PLUNGER DOWN DETECTED The PPM value will rise to the MAX setting, thus energising the Alarms as set in 4.3.1. Once the Manual Clean has been released the PPM value will count down. Once it has gone below the Alarm set point the Alarms will be de-energised. This function can also be used to simulate a high PPM reading thus triggering the Alarms, and then monitoring the Alarms when the PPM rate falls to within the set limits.	Manual Clean has become stuck in the down position.	Press the Manual clean UP & DOWN a few times to un stick. Check to ensure Manual Clean Operates as normal. Screen message will disappear. If system persists remove Manual Clean and check Wiper. Replace if wear evident or wipe damaged.

6.2 Faultfinding

```
*      W A R N I N G      *  
  
P L U N G E R   D O W N  
D E T E C T E D
```

Plunger down error is caused by the light path across the glass measuring cell being obscured. This can occur if the manualclean plunger is left in the down position or if the measuring cell is contaminated with oil, stained with rust deposits, or if there is an electrical fault with the cell pcb. The manualclean can be removed and cleaned with a rag, the cell can be drained and filled with a weak acid such as orange juice or vinegar and left to soak overnight before being flushed through with clean water.

```
* *   S Y S   E R R O R   * *  
  
C e l l   B r e a c h  
c o n t a c t   R T E
```

Cell Breach error is caused by damage to the measuring cell cover or removing the cover. The breach can only be reset at the factory.

```
* *   S Y S   E R R O R   * *  
  
C o m m u n i c a t i o n s  
f a i l u r e
```

Communication failure is caused by the loss of the RS485 signal between the measuring cell and the microcontroller module. Check that the cable connected to socket J15 on the microcontroller pcb is fully secure.

```
* *   S Y S   E R R O R   * *  
  
D e t e c t o r   0 - 7   i s  
u n d e r / o v e r r a n g e
```

Excessive Contaminates present in sample e.g. rust, bacteria, emulsified oils, detergents, discoloration of water.

```
* *   S Y S   E R R O R   * *  
  
R T C - I 2 C  
f a i l u r e
```

Real Time Clock Failure – Unit will not display or record the correct time and date. Contact RTE for service.

```
* *   S Y S   E R R O R   * *  
  
O i l   c o n t e n t   i s  
u n d e r / o v e r   r a n g e
```

Air Bubbles present in sample water. Increase back pressure using the Throttle Screw. Check sample pipework for leaks.

6.3 Additional Features and Functions

There are additional features that can be added to the Smart Bilge monitor which increases security and lessens maintenance. They are the flowswitch module and the autoclean module.

6.2.1.1 Flowswitch

```
*   W A R N I N G   *  
  
F L O W   E R R O R  
D E T E C T E D
```

The display will indicate an error if insufficient flow is detected through the measuring cell. Increase the flowrate through the measuring cell to above 0.8 l/min (Note: this is an option and not available on the standard monitor).

6.2.1.2 Autoclean

```
>  S e t   a n a l o g   o u t  
   V i e w   I M O   d a t a  
   D i a g n o s t i c s  
   A u t o c l e a n
```

If Autoclean has been invoked in the software then the user menu will include "Autoclean" as a sub menu.

(Note: this is an option and not available on the standard monitor).

```
>  E s c a p e  
   S e t   n o .   o p s  
   S e t   d e l a y
```

The screen will show two sub menus; the number of strokes the wiper will make and the delay between each autoclean action.

```
S e t   o p s   p e r  
      c y c l e  
  
3   o p s
```

Selecting ops per cycle and using the up or down arrow will increase or decrease the figure shown on the screen. Press Enter to return to previous menu.

```
S e t   d e l a y  
b e t w e e n   c y c l e s  
  
3 0   m i n s
```

Selecting delay between cycles and using the up or down arrow will increase or decrease the time shown on the screen. Press Enter to return to previous menu.

6.4 Technical Support Registration

To receive automatic product updates, news and information, log on to www.rivertrace.com and select tech support. Fill in the registration form and you will have access to support documents and the spares enquiry form.

	
EC Type Examination Certificate	
of a Notified Body within the meaning of Article 9 of the Marine Equipment Directive 96/98/EC of 20 December 1996.	
This is to certify that the equipment identified below has been tested in accordance with the relevant type approval procedures of the Marine Equipment Directive (MED) 96/98/EC, as amended, and was found in compliance with requirements of the specified standards contained therein subject to any conditions on the schedule attached hereto.	
Certificate No.	24 185 - 04 Lux
Applicant	Rivertrace Engineering Ltd. Unit P, Kingsfield Business Park Redhill, Surrey RH1 4DP, UNITED KINGDOM
Manufacturer	Rivertrace Engineering Ltd. Unit P, Kingsfield Business Park Redhill, Surrey RH1 4DP, UNITED KINGDOM
Product Description	Oil-content meters
Product Name	Smart Cell - Bilge
Trade Name	
Specified Standards	Marpol 73/78, Annex I, Reg. 14.7, Reg. 14.1 and 14.2 IMO Resolution MEPC.107(49)
Related Directive	2008/67/EC
Equipment Section	Marine pollution prevention
Item No.	A.1/2.3
Conformity Assessment Module	B
Valid until	2014-11-07
Page	1 of 2
Luxembourg,	2009-06-03
  R. Brück	
GL Luxembourg EC Identification No.: 0801	


GL Luxembourg

Certificate No: 24 185 - 04 Lux

Schedule of Approval

Documents

- Test reports according to MEPC 107(49), Part 2 and Part 3
- Drawings
 - SMART CELL Assembly 109072, Rev. A, dated 14.07.2004
 - SMART BILGE Assembly 109069, Rev. A, dated 14.07.2004

Remarks

None.

Note:

This certificate is valid for equipment, which is conform to the approved type. The manufacturer must inform the Notified Body named on this certificate of any modifications or changes to the approved product in order to obtain a valid certificate.

Should the specified standards be amended during the validity of this certificate, the product is to be re-approved prior to being placed on board the vessel to which the amended standards apply.

The mark of conformity may only be affixed to the above type approval equipment and a Manufacturer's Declaration of Conformity issued when the production-surveillance module (D, E or F) of Annex B of the MED is fully complied with and controlled by a written inspection agreement with a Notified Body.

Wheelmark Format:

	xxxx yy	xxxx yy	Notified Body identification number undertaking surveillance module Last two digits of year mark affixed
---	------------	------------	---

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Luxembourg, 2009-06-03


GL Luxembourg
EC Identification No.: 0801

EC Certificate of Conformity Quality System



of a Notified Body within the meaning of Article 9 of the Marine Equipment Directive 96/98/EC of 20 December 1996.

This is to certify that the applicant / manufacturer maintains a quality system which is in conformity with the requirements of the Marine Equipment Directive (MED) 96/98/EC, as amended, ensuring that the equipment identified below is conform to type as described in the EC Type Examination Certificate (listed in the annex to this certificate), subject to any conditions in the schedule attached hereto.

Certificate No. 24 186 - 04 Lux
Applicant Rivertrace Engineering Ltd.
Unit P, Kingsfield Business Park
Redhill, Surrey RH1 4DP, UNITED KINGDOM
Manufacturer Rivertrace Engineering Ltd.
Unit P, Kingsfield Business Park
Redhill, Surrey RH1 4DP, UNITED KINGDOM

Product Description Oil-content meters
Product Name Smart Cell - Bilge
Trade Name

EC Type Examination Certificate No. 24 185 - 04 Lux
Date of Issue 03.06.2009
Valid Until 07.11.2014
Notified Body ID No. 0801

Related Directive 2008/67/EC
Equipment Section Marine pollution prevention
Item No. A.1/2.3
Conformity Assessment Module D
Valid until 2014-11-07

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Luxembourg, 2009-06-03


R. Brück


GL Luxembourg
EC Identification No.: 0801



Certificate No: 24 186 - 04 Lux

Schedule of Approval

Remarks
None

Note:
This certificate loses its validity if the manufacturer makes any changes or modifications to the approved quality system, which have not been notified to, and agreed with the notified body named on this certificate and/or after lapse of time, withdrawal or revocation of the EC Type Examination Certificate.
This certificate authorises the applicant to affix the mark of conformity (wheelmark) to the equipment.
Wheelmark Format:

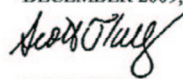


0801/yy yy Last two digits of year mark affixed

Page 2 of 2
Luxembourg, 2009-06-03



GL Luxembourg
EC Identification No.: 0801

	U. S. Department of Homeland Security
	United States Coast Guard
Certificate of Approval	
Coast Guard Approval Number: 162.050/9017/0	Expires: 04 December 2014
OIL POLLUTION PREVENTION EQUIPMENT The following device has been tested in accordance with IMO Resolution MEPC.107(49)	
RIVERTRACE ENGINEERING LTD. UNIT P KINGSFIELD BUSINESS CENTRE PHILANTHROPIC ROAD REDHILL RH1 4DP SURREY UNITED KINGDOM	
SMART-BILGE; 15 ppm Bilge Alarm.	
Equipment manufactured by Rivertrace Engineering Limited to drawing no. 109067 Rev. A4, dated July 14, 2004, drawing no. 109073 Rev. A3, dated July 23, 2004, drawing no. 109069 Rev. A3, dated October 28, 2004, and drawing no. 109071 Rev. A3, dated July 14, 2004.	
A copy of this certificate should be carried aboard a vessel fitted with this equipment at all times.	
IMO Certificates of Type Approval do not expire and are valid for equipment manufactured at any time during the period of validity of this certificate.	
Only the manufacturer of the bilge alarm may apply for this certificate to be renewed.	
Test data and results attached in the appendix.	
This certificate documents compliance with 46 CFR 162.050.	
*** END ***	
THIS IS TO CERTIFY THAT the above named manufacturer has submitted to the undersigned satisfactory evidence that the item specified herein complies with the applicable laws and regulations as outlined on the reverse side of this Certificate, and approval is hereby given. This approval shall be in effect until the expiration date hereon unless sooner canceled or suspended by proper authority.	
	GIVEN UNDER MY HAND THIS 4 th DAY OF DECEMBER 2009, AT WASHINGTON D.C.  S. J. KELLY Chief, Engineering Division U.S. Coast Guard Marine Safety Center

DEPT. OF HOMELAND SECURITY, USCG, CGHQ-10030
(REV. 3-03)