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# Report On

Testing of the  
Ocean Signal  
RescueME MOB1  
In accordance with RTCM 11901.1 and IEC 60945

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REPORT ON

Testing of the  
Ocean Signal  
RescueME MOB1  
In accordance with RTCM 11901.1

Document 75941047 Report 02 Issue 1

June 2018

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DATED

08 June 2018

12 June 2018

12 June 2018





## CONTENTS

| Section        | Page No   |
|----------------|---|
| <b>1</b>       | <b>REPORT SUMMARY .....3</b>                            |
| 1.1            | Introduction.....4                                      |
| 1.2            | Brief Summary of Results .....5                         |
| 1.3            | Declaration of Build .....7                             |
| 1.4            | Product Information .....8                              |
| 1.5            | Deviations from the Standard.....10                     |
| 1.6            | Modification Record.....11                              |
| <b>2</b>       | <b>TEST DETAILS .....12</b>                             |
| 2.1            | Pre-test Checks .....13                                 |
| 2.2            | Dry Heat .....14  |
| 2.3            | Damp Heat .....19                                       |
| 2.4            | Low Temperature .....21                                 |
| 2.5            | Thermal Shock .....25                                   |
| 2.6            | Drop onto Hard Surface .....27                          |
| 2.7            | Drop into Water (NUA) .....29                           |
| 2.8            | Vibration .....32                                       |
| 2.9            | Rain and Spray.....42                                   |
| 2.10           | Immersion.....44  |
| 2.11           | Solar Radiation.....46                                  |
| 2.12           | Oil Resistance .....47                                  |
| 2.13           | Corrosion (Salt Mist).....48                            |
| 2.14           | Compass Safe Distance.....49                            |
| 2.15           | Buoyancy Test.....51                                    |
| 2.16           | Controls and Indicators Tests (NUA) .....52             |
| 2.17           | Test of the Self-Test Mode.....73                       |
| 2.18           | Internal Navigation Device Scenarios (Annex F) .....78  |
| 2.19           | Battery Capacity Test.....83                            |
| <b>3</b>       | <b>TEST EQUIPMENT USED.....87</b>                       |
| <b>4</b>       | <b>PHOTOGRAPHS .....91</b>                              |
| <b>5</b>       | <b>ACCREDITATION, DISCLAIMERS AND COPYRIGHT .....94</b> |
| <b>ANNEX A</b> | <b>Manufacturer Supplied Information ..... A.2</b>      |



Product Service

## **SECTION 1**

### **REPORT SUMMARY**

Testing of the  
Ocean Signal  
RescueME MOB1  
In accordance with RTCM 11901.1 and IEC 60945



Product Service

## 1.1 INTRODUCTION

The information contained in this report is intended to show verification of testing of the Ocean Signal, RescueME MOB1, to limited requirements of RTCM 11901.1 and IEC 60945.

|                               |   |
|-------------------------------|---|
| Objective                     | To perform Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out. |
| Manufacturer                  | Ocean signal  |
| Model Number(s)               | RescueME MOB1   |
| Brandname Holder              | N/A   |
| Brandname Model Number(s)     | N/A   |
| Serial Number(s)              | 2886K1642017<br>0170706044Q (conducted)   |
| Number of Samples Tested      | 2   |
| Test Specification/Issue/Date | RTCM 11901.1 (2012)<br>IEC 60945 (2002) incorporating corrigendum April 2008  |
| Order Number                  | 4161  |
| Date                          | 27 November 2017  |
| Start of Test                 | 15 December 2017  |
| Finish of Test                | 20 March 2018   |
| Name of Engineer(s)           | S Jones<br>N Douglas<br>C Bowles<br>P Joynson<br>F Van Niekerk<br>C Hedley  |
| Related Document(s)           | ISO 694: 2000   |



## 1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with RTCM 11901.1 is shown below.

| Section                             | Spec. Clause                  | Test Description  | Result | Comments                      |
|-------------------------------------|-------------------------------|---|--------|-------------------------------|
| 2.1 - 2.13                          | 8.1.2                         | Tests for durability and resistance to environmental conditions | -      | See Table below for IEC 60945 |
| 2.15                                | 8.1.3                         | Buoyancy test   | N/A    |                               |
| 2.16                                | 8.1.4                         | Controls and indicators tests                                   | -      | See section 2.16              |
| -                                   | 8.1.5                         | Activation tests  | N/T    |                               |
| 2.17                                | 8.1.6                         | Test of the Self-Test Mode                                      | Pass   |                               |
| 2.19                                | 8.1.7                         | Battery Capacity and Low Temperature Test                       | Pass   | See section 2.19              |
| -                                   | 8.1.8                         | Spurious and Out-of-Band Emissions                              | N/T    |                               |
| Annex A: DSC Type MSLD System       |                               |   |        |                               |
| -                                   | A.4                           | Performance Tests – DSC Transmitter                             | N/T    |                               |
| -                                   | A.5                           | Performance Tests – DSC Receiver                                | N/T    |                               |
| Annex E: AIS Type MSLD System       |                               |   |        |                               |
| 2.19                                | E.6.5                         | Battery capacity test   | Pass   |                               |
| -                                   | E.7.1.1.1                     | Frequency error   | N/T    |                               |
| -                                   | E.7.2                         | Conducted Power   | N/T    |                               |
| -                                   | E.7.3                         | Radiated Power  | N/T    |                               |
| -                                   | E.7.3.1.4                     | Modulation spectrum slotted transmission                        | N/T    |                               |
| -                                   | E.7.4                         | Transmitter test sequence and modulation accuracy               | N/T    |                               |
| -                                   | E.7.5                         | Transmitter output power versus time function                   | N/T    |                               |
| 2.26                                | E.7.6                         | Spurious emissions from the transmitter                         | N/T    |                               |
| Annex E: Link Layer                 |                               |   |        |                               |
| -                                   | E.8.2 (E.8.2.1.2 – E.8.2.1.8) | Active mode tests   | N/T    |                               |
| -                                   | E.8.2.1.11 (E.8.2.1.13)       | Test mode tests with EPFS data available                        | N/T    |                               |
| -                                   | E.8.2.1.14 (E.8.2.1.16)       | Test mode tests without EPFS data available                     | N/T    |                               |
| Annex F: Internal Navigation Device |                               |   |        |                               |
| 2.18                                | F.2.2                         | Scenarios   | Pass   |                               |

N/A: Not Applicable

N/T: Not Tested



A brief summary of the tests carried out in accordance with IEC 60945 is shown below.

| Section | Spec. Clause | Test Description       | Result       | Comments                                   |
|---------|--------------|------------------------|--------------|--|
| 2.2     | 8.2          | Dry heat               | Satisfactory |  |
| 2.3     | 8.3          | Damp heat              | Satisfactory |  |
| 2.4     | 8.4          | Low temperature        | Satisfactory |  |
| 2.5     | 8.5          | Thermal shock          | Satisfactory |  |
| 2.6     | 8.6          | Drop onto hard surface | Satisfactory |  |
| 2.7     | 8.6          | Drop into water        | Satisfactory |  |
| 2.8     | 8.7          | Vibration              | Satisfactory |  |
| 2.9     | 8.8          | Rain and Spray         | Satisfactory | As modified by RTCM 11901.1 clause 8.1.5.2 |
| 2.10    | 8.9          | Immersion              | Satisfactory |  |
| 2.11    | 8.10         | Solar radiation        | -            | Not tested                                 |
| 2.12    | 8.11         | Oil resistance         | -            | Not tested                                 |
| 2.13    | 8.12         | Corrosion (salt mist)  | -            | Not tested                                 |
| 2.14    | 11.2         | Compass safe distance  | -            | See section 2.13                           |



1.3 DECLARATION OF BUILD

| MAIN EUT   |                         |
|--|-------------------------|
| MANUFACTURING DESCRIPTION  |                         |
| MANUFACTURER   | Ocean Signal Limited    |
| MODEL NAME/NUMBER  | rescueME MOB1           |
| PART NUMBER  | 740S-01551              |
| SERIAL NUMBER  |                         |
| HARDWARE VERSION   | 02.00                   |
| SOFTWARE VERSION   |                         |
| PSU VOLTAGE/FREQUENCY/CURRENT  | 6v                      |
| HIGHEST INTERNALLY GENERATED / USED FREQUENCY                                    | 162.025MHz              |
| FCC ID (if applicable)   | XYE MOB1                |
| INDUSTRY CANADA ID (if applicable)   | certificate 9296A-MOB1X |
| TECHNICAL DESCRIPTION<br>(a brief description of the intended use and operation) | MSLD device             |
| COUNTRY OF ORIGIN  | UK                      |
| RF CHARACTERISTICS (if applicable)   |                         |
| TRANSMITTER FREQUENCY OPERATING RANGE (MHz)                                      | 161.975 & 162.025 MHz   |
| RECEIVER FREQUENCY OPERATING RANGE (MHz)   | N/A                     |
| INTERMEDIATE FREQUENCIES   | N/A                     |
| EMISSION DESIGNATOR(S):<br>(i.e. G1D, GXW)                                       | 16K0GXW                 |
| MODULATION TYPES:<br>(i.e. GMSK, QPSK)   | GMSK                    |
| OUTPUT POWER (W or dBm)  | 1W                      |
| SEPARATE BATTERY/POWER SUPPLY (if applicable)                                    |                         |
| MANUFACTURING DESCRIPTION  |                         |
| MANUFACTURER   |                         |
| TYPE   |                         |
| PART NUMBER  |                         |
| PSU VOLTAGE/FREQUENCY/CURRENT  |                         |
| COUNTRY OF ORIGIN  |                         |
| MODULES (if applicable)  |                         |
| MANUFACTURING DESCRIPTION  |                         |
| MANUFACTURER   |                         |
| TYPE   |                         |
| POWER  |                         |
| FCC ID   |                         |
| INDUSTRY CANADA ID   |                         |
| EMISSION DESIGNATOR  |                         |
| DHSS/FHSS/COMBINED OR OTHER  |                         |
| COUNTRY OF ORIGIN  |                         |
| ANCILLARIES (if applicable)  |                         |
| MANUFACTURING DESCRIPTION  |                         |
| MANUFACTURER   |                         |
| TYPE   |                         |
| PART NUMBER  |                         |
| SERIAL NUMBER  |                         |
| COUNTRY OF ORIGIN  |                         |

I hereby declare that the information supplied is correct and complete.

Name: Simon Nolan

Position held: Chief Technical Officer

Date: 23/02/2018





## 1.4 PRODUCT INFORMATION

### 1.4.1 Technical Description

The Equipment Under Test (EUT) was an Ocean Signal, RescueME MOB1 as shown in the photograph below. A full technical description can be found in the manufacturer's documentation.



Equipment Under Test



### 1.4.2 Monitoring of Performance

Performance Checks and Performance Tests were defined by RTCM 11901.1 as follows:

#### AIS Performance Check

Method: Activate the EUT in test mode with GPS data available.

Requirements: Successful reception of Message 1 and Message 14 via a Class A AIS.

#### AIS Performance Test

Method: Activate the AU in test mode with GPS data available.

Requirements - AIS:

- a) EUT starts transmission after valid GPS data available
- b) Burst of 8 messages in the correct order and correctly populated:
  - AIS 1, Message 14 "MOB TEST"
  - AIS 2, Message 1, Nav Status 15, comm-state (time-out=0, sub-message=0)
  - AIS 1, Message 1, Nav Status 15, comm-state (time-out=0, sub-message=0)
  - AIS 2, Message 1, Nav Status 15, comm-state (time-out=0, sub-message=0)
  - AIS 1, Message 1, Nav Status 15, comm-state (time-out=0, sub-message=0)
  - AIS 2, Message 1, Nav Status 15, comm-state (time-out=0, sub-message=0)
  - AIS 1, Message 1, Nav Status 15, comm-state (time-out=0, sub-message=0)
  - AIS 2, Message 14 "MOB TEST"
  - It is permissible to start the sequence on AIS 2
- c) User ID as configured
- d) Navigational status = 15 (not defined)
- e) SOG = actual SOG from GPS simulator
- f) Position accuracy flag = according to the RAIM result if provided, otherwise 0
- g) Position = actual position from GPS
- h) COG = actual COG from GPS simulator
- i) Time stamp = actual UTC second (0...59)
- j) Communication state time-out always = 0 with sub message = 0
- k) Transmission of Messages 1 and 14 stops after one burst of 8 messages
- l) Text message in Message 14 is "MOB TEST"
- m) Correct indication as per manufacturer's documentation

#### Additional DSC Check

Self-Test with GPS data: Activate the EUT in test mode with GPS data available.

Requirements: Successful reception of Routine RT Call request via the Sailor RT5022 VHF with DSC radio.

Active Mode with GPS data: Activate the EUT in test mode with GPS data available.

Requirements: Successful reception of Distress Relay via the Sailor RT5022 VHF with DSC radio. Correct MMSI displayed.



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## 1.5 DEVIATIONS FROM THE STANDARD

Clause 8.1.2 of RTCM 11901.1 indicates that one single item of equipment should be used for the environmental tests as per IEC60945 (sections 2.2 – 2.12 of this report) and should be carried out in the order given in IEC 60945. The following order of tests was carried out:

- Dry Heat Storage
- Dry Heat Functional
- Low Temperature Storage
- Damp Heat
- Low Temperature Functional
- Thermal Shock
- Drop onto Hard Surface
- Drop into Water
- Vibration
- Rain and Spray
- Immersion

The Battery Capacity Test was carried out on an additional conducted sample 2.

The Manufacturer has provided data with respect to a waiver for the following clauses:

- Solar radiation
- Oil resistance
- Corrosion



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**1.6 MODIFICATION RECORD**

The table below details modifications made to the EUT during the test programme. The modifications incorporated during each test are recorded on the appropriate test pages.

Sample 1

| Physical Modification | Description | Fitted by | Date |
|-----------------------|-------------|-----------|------|
| 0                     | As supplied | N/A       | N/A  |

Sample 2 conducted

| Physical Modification | Description   | Fitted by    | Date |
|-----------------------|---|--------------|------|
| 1                     | GPS Timing altered to provide 5 mins on /off in first hour without GNSS, 5 mins on every 20 mins after. | Manufacturer | N/A  |



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## **SECTION 2**

### **TEST DETAILS**

Testing of the  
Ocean Signal  
RescueME MOB1  
In accordance with RTCM 11901.1 and IEC 60945



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## **2.1 PRE-TEST CHECKS**

### **2.1.1 Specification Reference**

IEC 60945, Clause 8.1

### **2.1.2 Equipment Under Test and Modification State**

RescueME MOB1, MMSI 972001071 (TSR0001) and Mod State 0  
RescueME MOB1, MMSI 972606044 (TSR0007) and Mod State 1

### **2.1.3 Date of Test**

17 December 2017

### **2.1.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

### **2.1.5 Environmental Conditions**

Ambient Temperature 22.7 °C  
Relative Humidity 35.2 %

### **2.1.6 Test Results**

#### Visual Inspection

Prior to the start of the testing schedule the EUTs were visually inspected. No signs of damage were found.

#### Mechanical and Electrical Check

A check was made to ensure that the EUTs were functional before all upcoming tests.



## 2.2 DRY HEAT

### 2.2.1 Specification Reference

IEC 60945, Clause 8.2

### 2.2.2 Equipment Under Test and Modification State

RescueME MOB1, MMSI 972001071 (TSR0001) and Mod State 0

### 2.2.3 Date of Test

19 – 20 December 2017 (Storage)

06 – 07 January 2018 (Functional)

### 2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.2.5 Environmental Conditions

Ambient Temperature 17.3 – 19.5 °C

Relative Humidity 26.1 – 51.8 %

### 2.2.6 Test Setup



Test Setup - Storage and Functional Test



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### 2.2.7 Test Method

#### Storage Test

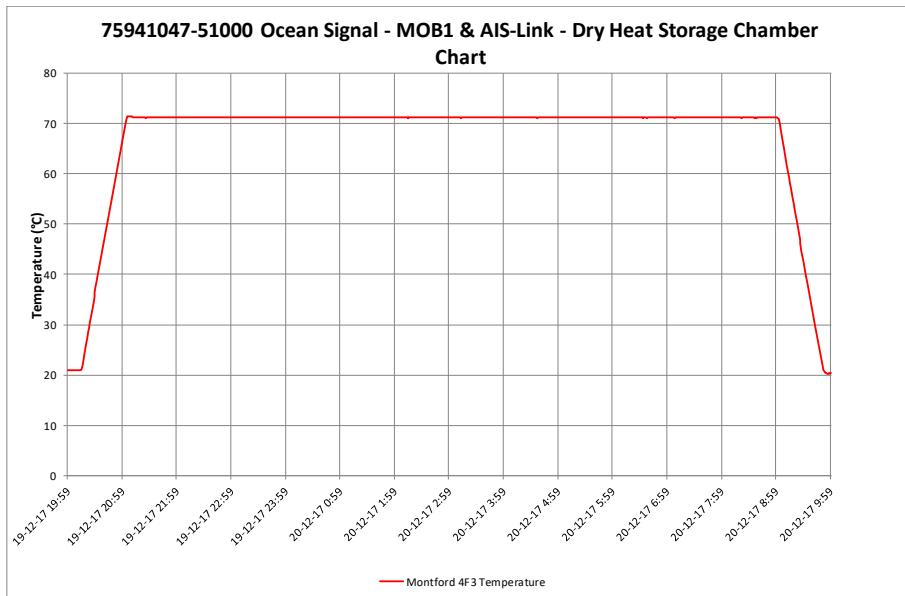
The EUTs were placed in a climatic chamber where the temperature was increased from laboratory ambient temperature to +70 °C. After 12 hours, the temperature was returned to ambient conditions. The EUT was subjected to an AIS Performance Check at the end of the test. An additional DSC self-test check (with GPS data) was carried out.

#### Functional Test

The EUT was switched on, and placed in a climatic chamber where the temperature was increased from ambient temperature to +55 °C. The conditions remained for a period of 15 hours, during the end of this period the EUT was subjected to an AIS Performance Test and Active mode DSC checks were made. The temperature was returned to laboratory ambient conditions.

After the test, an AIS Performance Check was carried out. An active mode DSC check was carried out.

### 2.2.8 Test Results



Dry Heat Storage Test Temperature Plot



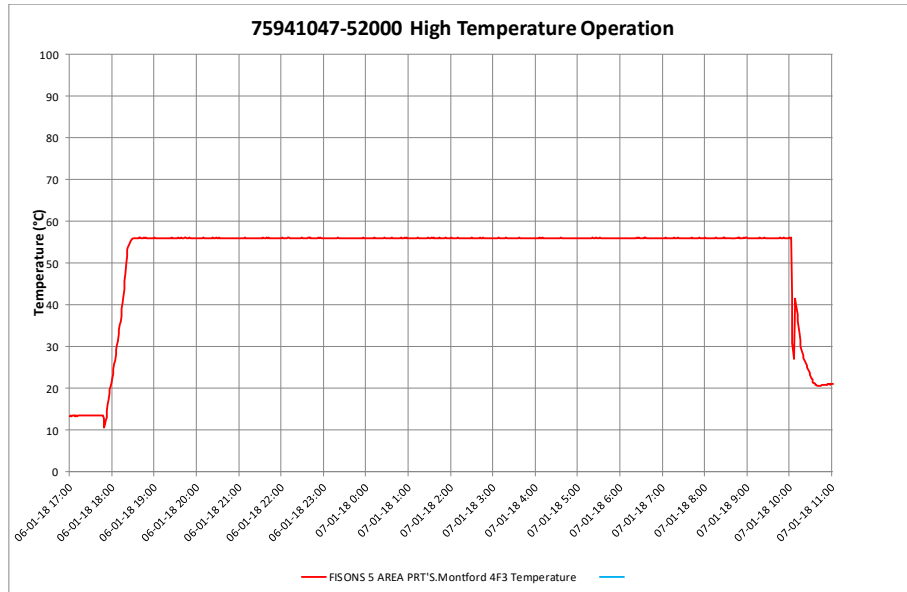


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Post-Storage Period Performance Check

| Parameter                          | Units | Result | Limit |
|------------------------------------|-------|--------|-------|
| Successful reception of Message 1  | Y / N | Y      | Y     |
| Successful reception of Message 14 | Y / N | Y      | Y     |

| Parameter                                     | Units | Result | Limit |
|---|-------|--------|-------|
| Successful reception of DSC Message 972001071 | Y / N | Y      | Y     |



Dry Heat Functional Test Temperature Plot

Dry Heat Storage Post Test Performance Check

| Parameter                          | Units | Result | Limit |
|------------------------------------|-------|--------|-------|
| Successful reception of Message 1  | Y / N | Y      | Y     |
| Successful reception of Message 14 | Y / N | Y      | Y     |

| Parameter                           | Units | Result | Limit |
|-------------------------------------|-------|--------|-------|
| Successful reception of DSC Message | Y / N | Y      | Y     |

Dry Heat Functional Period Performance Test

| Parameter  | Units | Result | Limit            |
|--|-------|--------|------------------|
| EUT starts transmission after valid GPS data available | Y / N | Y      | Y                |
| Burst of 8 messages – AIS1/2 alternates                | Y / N | Y      | Y                |
| Burst of 8 messages – Sequence 1x14, 6x1, 1x14         | Y / N | Y      | Y                |
| User ID as configured                                  | Y / N | Y      | Y                |
| Nav Status   | -     | 14     | 14               |
| SOG Error  | kn    | 0.0    | < 0.2 (See Note) |
| Position accuracy flag                                 | 1 bit | 0      | RAIM result / 0  |
| Position Error   | m     | 0      | <1               |
| COG  | 0     | 0      |                  |
| Timestamp (UTC)  | s     | 22     | 0-59             |
| Communication state time-out                           | 1 bit | 0      | 0                |
| Communication state sub message                        | 1 bit | 1      | 1                |



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|  |       |            |            |
|--|-------|------------|------------|
| Transmission stops after one burst of 8 messages       | Y / N | Y          | Y          |
| Text message in Message 14                             | -     | MOB ACTIVE | MOB ACTIVE |
| Correct indication as per manufacturer's documentation | Y / N | Y          | Y          |

Dry Heat Functional Post Test Performance Check

| Parameter                          | Units | Result | Limit |
|------------------------------------|-------|--------|-------|
| Successful reception of Message 1  | Y / N | Y      | Y     |
| Successful reception of Message 14 | Y / N | Y      | Y     |

| Parameter                                     | Units | Result | Limit |
|---|-------|--------|-------|
| Successful reception of DSC Message 972001071 | Y / N | Y      | Y     |



## 2.3 DAMP HEAT

### 2.3.1 Specification Reference

IEC 60945, Clause 8.3

### 2.3.2 Equipment Under Test and Modification State

RescueME MOB1, MMSI 972001071 (TSR0001) and Mod State 0

### 2.3.3 Date of Test

10 – 11 January 2017

### 2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.3.5 Environmental Conditions

Ambient Temperature 20.5 – 23.9 °C

Relative Humidity 34.9 – 41.3 %

### 2.3.6 Test Setup



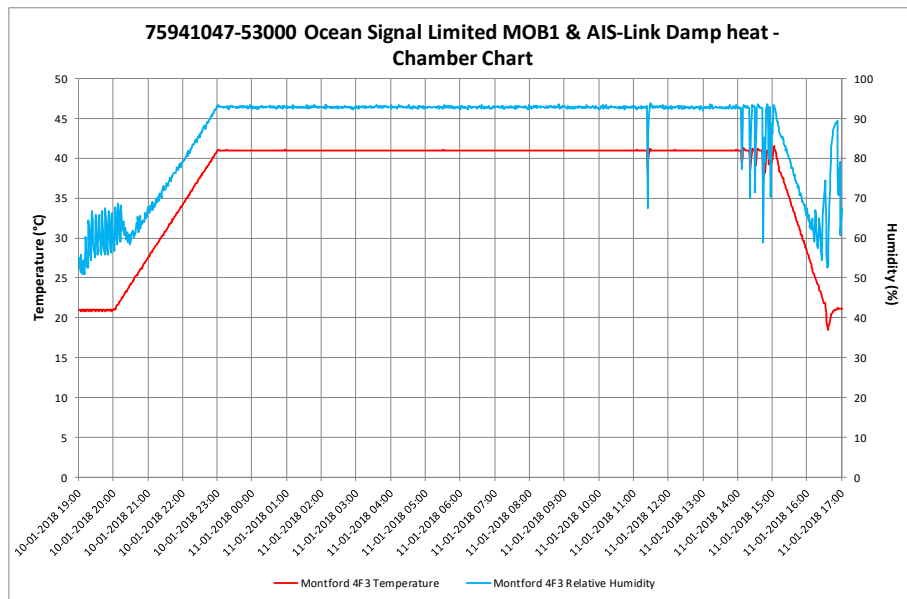
Test Setup



**2.3.7 Test Method**

The EUT was placed in a climatic chamber with the temperature increased to 40°C and the relative humidity increased to 93% over 3 hours. After 12 hours, the EUT was activated for at least 2 hours (whilst maintaining the damp heat conditions), during this period the EUT was subjected to an AIS Performance Check and DSC Active Mode check.

**2.3.8 Test Results**



Damp Heat Test Temperature Plot

The change in relative humidity towards the end of the test can be attributed to the opening of the environmental test chamber in order to activate the EUT.

Damp Heat Operational Period Performance Check

| Parameter                          | Units | Result | Limit |
|------------------------------------|-------|--------|-------|
| Successful reception of Message 1  | Y / N | Y      | Y     |
| Successful reception of Message 14 | Y / N | Y      | Y     |

| Parameter                                     | Units | Result | Limit |
|---|-------|--------|-------|
| Successful reception of DSC Message 972001071 | Y / N | Y      | Y     |



## 2.4 LOW TEMPERATURE

### 2.4.1 Specification Reference

IEC 60945, Clause 8.4

### 2.4.2 Equipment Under Test and Modification State

RescueME MOB1, MMSI 972001071 (TSR0001) and Mod State 0

### 2.4.3 Date of Test

07 – 08 January 2018 (Storage Test)  
11 – 12 January 2018 (Functional Test)

### 2.4.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.4.5 Environmental Conditions

Ambient Temperature 13.9 – 24.2 °C  
Relative Humidity 30.3 – 41.8 %

### 2.4.6 Test Setup



Test Setup – Storage and Functional Test



**2.4.7 Test Method**

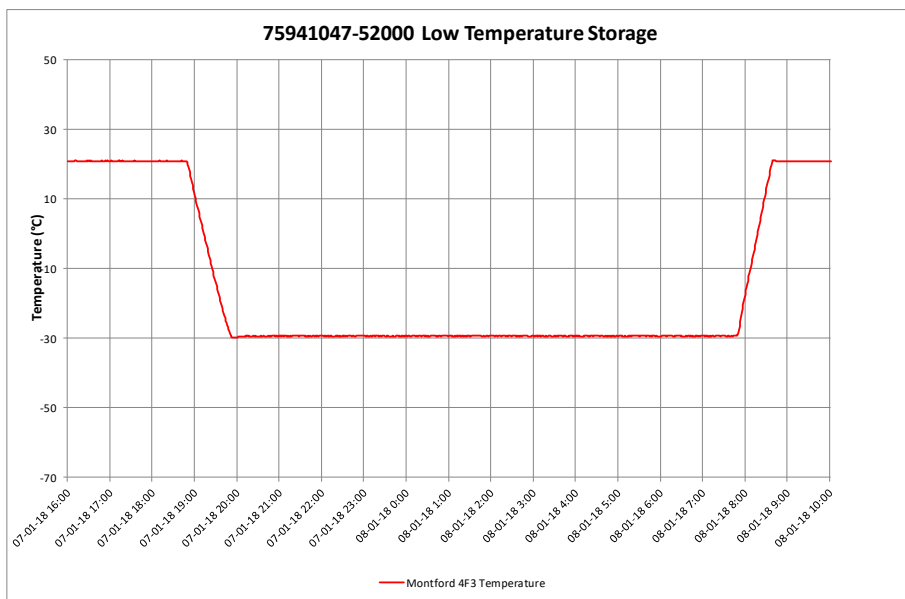
Storage Test

The EUT was placed in a climatic chamber with the temperature reduced to -30°C. After approximately 11.5 hours, the temperature was increased to ambient and the EUT was subjected to an AIS Performance Check, and DSC Active Mode check.

Functional Test

The EUT was placed in a climatic chamber with the temperature reduced to -20°C. After 19 hours, the EUT was activated for at least 2 hours and during this period was subjected to an AIS Performance Test and Check, and a DSC Active Mode check.

**2.4.8 Test Results**

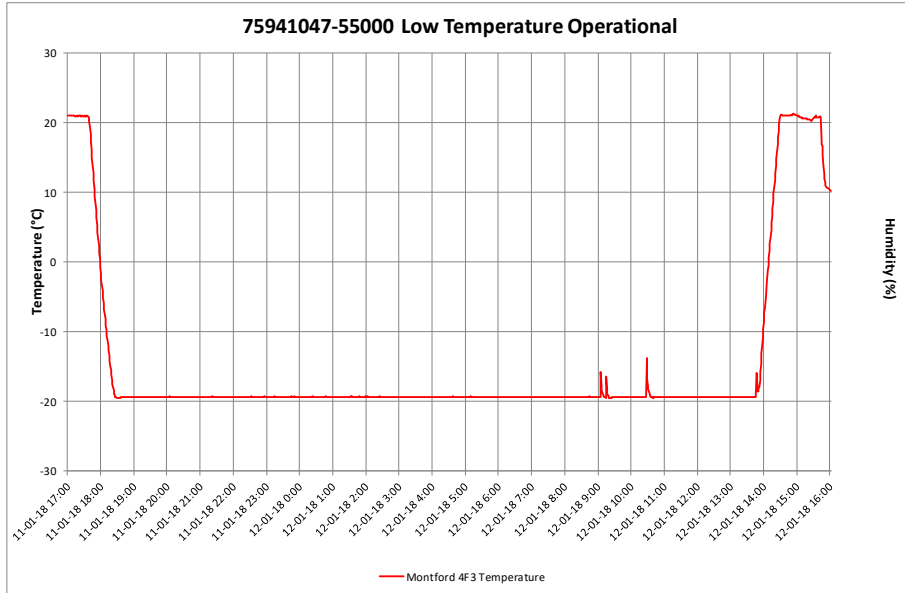


Low Temperature Storage Plot

Low Temperature Storage Post Test Performance Check

| Parameter                          | Units | Result | Limit |
|------------------------------------|-------|--------|-------|
| Successful reception of Message 1  | Y / N | Y      | Y     |
| Successful reception of Message 14 | Y / N | Y      | Y     |

| Parameter                                     | Units | Result | Limit |
|---|-------|--------|-------|
| Successful reception of DSC Message 972001071 | Y / N | Y      | Y     |



Low Temperature Functional Plot





Low Temperature Functional Test Performance Test (during 2-hour operational period)

| Parameter  | Units | Result     | Limit           |
|--|-------|------------|-----------------|
| EUT starts transmission after valid GPS data available | Y / N | Y          | Y               |
| Burst of 8 messages – AIS1/2 alternates                | Y / N | Y          | Y               |
| Burst of 8 messages – Sequence 1x14, 6x1, 1x14         | Y / N | Y          | Y               |
| User ID as configured                                  | Y / N | Y          | Y               |
| Nav Status   | -     | 14         | 14              |
| SOG Error  | kn    | 0          | < 0.2           |
| Position accuracy flag                                 | 1 bit | 0          | RAIM result / 0 |
| Position Error   | m     | >10        | < 30            |
| COG  | -     | 0          | 0               |
| Timestamp (UTC)  | s     | 22         | 0-59            |
| Communication state time-out                           | 1 bit | 0          | 0               |
| Communication state sub message                        | 1 bit | 0          | 0               |
| Transmission stops after one burst of 8 messages       | Y / N | Y          | Y               |
| Text message in Message 14                             | -     | MOB ACTIVE | MOB ACTIVE      |
| Correct indication as per manufacturer's documentation | Y / N | Y          | Y               |

Performance Check (Start of 2 hour on time)

| Parameter                          | Units | Result | Limit |
|------------------------------------|-------|--------|-------|
| Successful reception of Message 1  | Y / N | Y      | Y     |
| Successful reception of Message 14 | Y / N | Y      | Y     |

| Parameter                                     | Units | Result | Limit |
|---|-------|--------|-------|
| Successful reception of DSC Message 972001071 | Y / N | Y      | Y     |

Performance Check (End of 2 hour on time)

| Parameter                          | Units | Result | Limit |
|------------------------------------|-------|--------|-------|
| Successful reception of Message 1  | Y / N | Y      | Y     |
| Successful reception of Message 14 | Y / N | Y      | Y     |

| Parameter                                     | Units | Result | Limit |
|---|-------|--------|-------|
| Successful reception of DSC Message 972001071 | Y / N | Y      | Y     |



## 2.5 THERMAL SHOCK

### 2.5.1 Specification Reference

IEC 60945, Clause 8.5

### 2.5.2 Equipment Under Test and Modification State

RescueME MOB1, MMSI 972001071 (TSR0001) and Mod State 0

### 2.5.3 Date of Test

31 January 2018

### 2.5.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.5.5 Environmental Conditions

Ambient Temperature 24.9 - 27.4 °C

Relative Humidity 35.7 - 38.8 %

### 2.5.6 Test Setup



Test Setup (1-hour immersion)

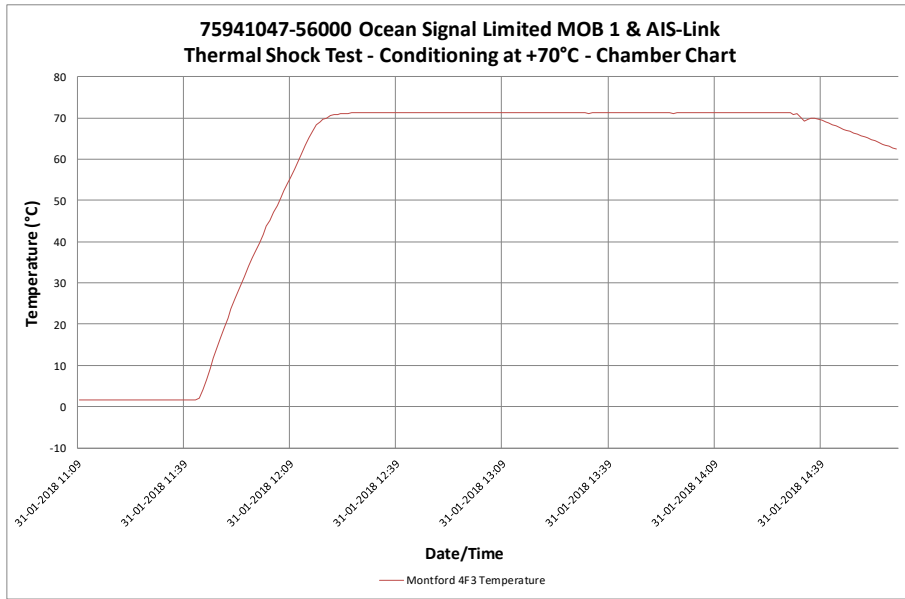


**2.1.1 Test Method**

The EUT was placed in the pre-conditioning climatic chamber at a temperature of +70 °C for >2 hours

The EUT was then immersed in a water vessel preconditioned at 25 °C, at a level of 100 mm below the surface of the water (measured to the highest point of the EUT) for 1 hour.

**2.5.7 Test Results**



Preconditioning Temperature Plot

Performance Check

| Parameter                          | Units | Result | Limit |
|------------------------------------|-------|--------|-------|
| Successful reception of Message 1  | Y / N | Y      | Y     |
| Successful reception of Message 14 | Y / N | Y      | Y     |

| Parameter                                     | Units | Result | Limit |
|---|-------|--------|-------|
| Successful reception of DSC Message 972001071 | Y / N | Y      | Y     |



## 2.6 DROP ONTO HARD SURFACE

### 2.6.1 Specification Reference

IEC 60945, Clause 8.6

### 2.6.2 Equipment Under Test and Modification State

RescueME MOB1, MMSI 972001071 (TSR0001) and Mod State 0

### 2.6.3 Date of Test

01 February 2018

### 2.6.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.6.5 Environmental Conditions

Ambient Temperature 23.8 °C

Relative Humidity 47.9 %

### 2.6.6 Test Setup



Test Setup



Product Service

**2.6.7 Test Method**

The EUT was dropped 6 times, once on each face, from a height of 1000 mm ± 10 mm onto the test surface (solid piece of hardwood).

**2.6.8 Test Results**

EUT Response

The EUT did not activate throughout the test.

Visual Inspection

The EUT was examined for external indications of damage; none was found.

Performance Check

| Parameter                          | Units | Result | Limit |
|------------------------------------|-------|--------|-------|
| Successful reception of Message 1  | Y / N | Y      | Y     |
| Successful reception of Message 14 | Y / N | Y      | Y     |

| Parameter                                     | Units | Result | Limit |
|---|-------|--------|-------|
| Successful reception of DSC Message 972001071 | Y / N | Y      | Y     |



Product Service

**2.7 DROP INTO WATER (NUA)****2.7.1 Specification Reference**

IEC 60945, Clause 8.6

**2.7.2 Equipment Under Test and Modification State**

RescueME MOB1, MMSI 972001071 (TSR0001) and Mod State 0

**2.7.3 Date of Test**

08 February 2018

**2.7.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

**2.7.5 Environmental Conditions**

Ambient Temperature 22.0 °C

Relative Humidity 41.0 %

**2.7.6 Test Method**

The EUT was dropped three times from a height of 20 m into water. For each drop, the EUT was orientated in a plane mutually perpendicular to the planes of the other drops.



### 2.7.7 Test Setup



Drop into water test setup

### 2.7.8 Test Results

#### EUT Response

Drop 1 (as per above): no indication of activation or damage.

Drop 2 (90° from vertical): no indication of activation or damage.

Drop 3 (inverted): no indication of activation or damage, activation red cover moved to activated position.

#### Examination

The EUT was subjected to an external visual inspection post-test and no signs of ingress or external damage were observed.



Product Service

Performance Check

| Parameter                          | Units | Result | Limit |
|------------------------------------|-------|--------|-------|
| Successful reception of Message 1  | Y / N | Y      | Y     |
| Successful reception of Message 14 | Y / N | Y      | Y     |

| Parameter                                     | Units | Result | Limit |
|---|-------|--------|-------|
| Successful reception of DSC Message 972001071 | Y / N | Y      | Y     |





## 2.8 VIBRATION

### 2.8.1 Specification Reference

IEC 60945, Clause 8.7

### 2.8.2 Equipment Under Test and Modification State

RescueME MOB1, MMSI 972001071 (TSR0001) and Mod State 0

### 2.8.3 Date of Test

08 February 2018

### 2.8.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.8.5 Environmental Conditions

Ambient Temperature 22.5 - 27.0 °C

Relative Humidity 49.3 - 60.8 %

### 2.8.6 Test Setup



Test Setup (Up and Down) \*

\*The EUT (TSR0001) is the item on the left-hand side of the photograph.



Test Setup (Forward and Aft)



Test Setup (Side to Side)



Product Service

### 2.8.7 Test Method

The EUT was fixed to the vibration table and was subject to the following vibration profiles:

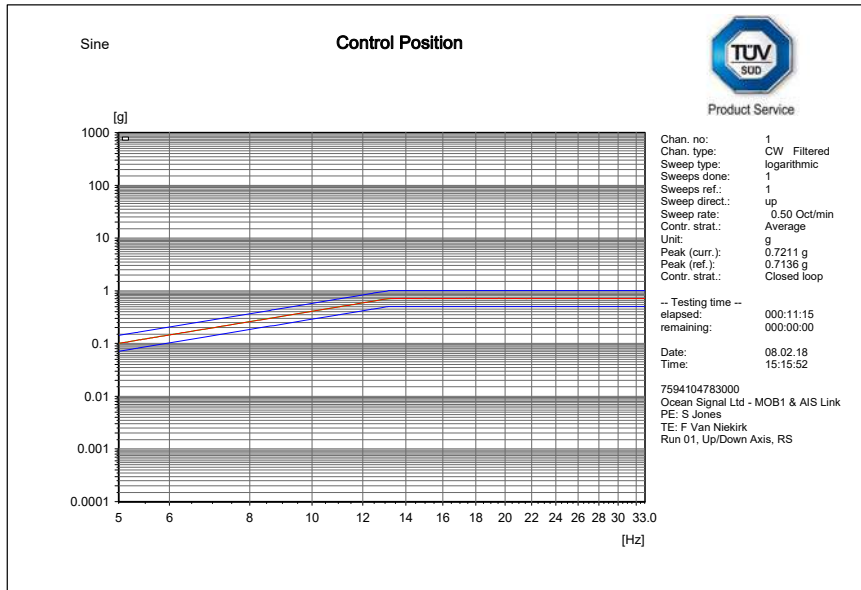
#### Resonance Sweep

- 5 Hz and up to 13.2 Hz with an excursion of  $\pm 1$  mm ( $7 \text{ m/s}^2$  maximum acceleration at 13.2 Hz);
- above 13.2 Hz and up to 100 Hz with a constant maximum acceleration of  $7 \text{ m/s}^2$ .

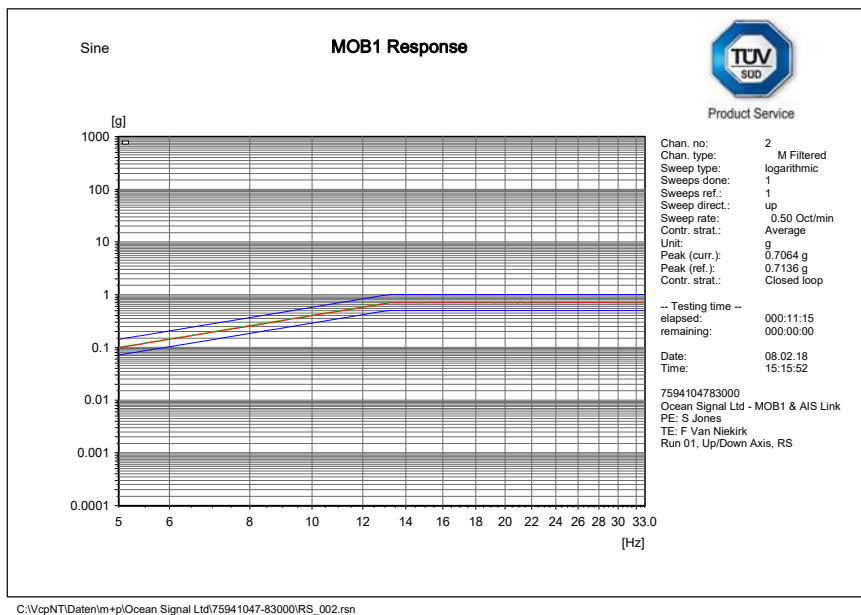
One sweep was performed at a rate of 0.5 octaves / minute.

No resonant frequencies were found and therefore the endurance run was carried out at 30 Hz.

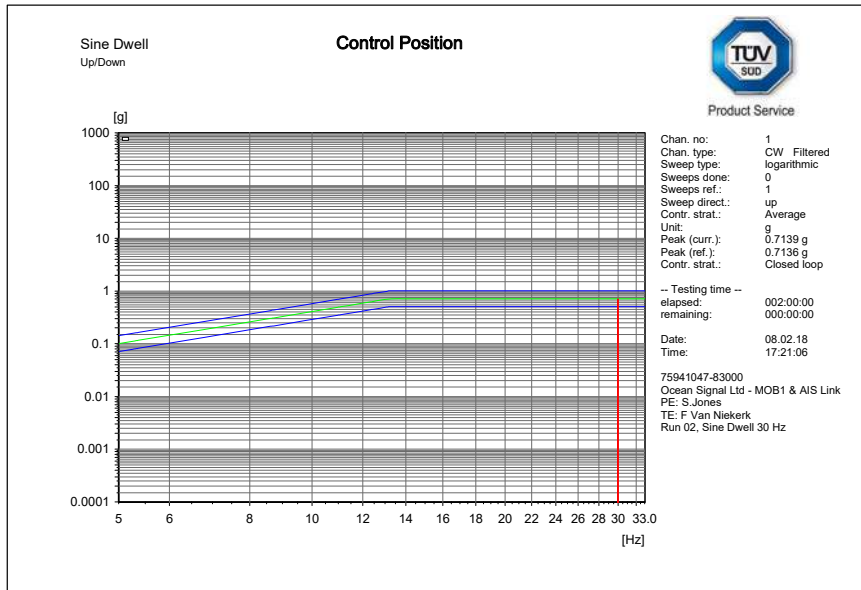
At the end of the test, the EUT was subjected to a Performance Check.



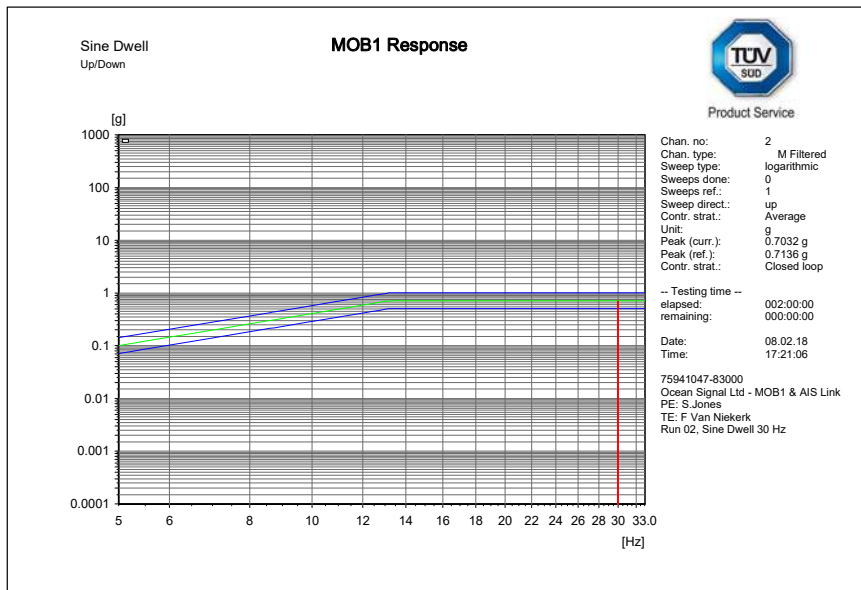
Up and Down Axis – Resonance Search (Control)



Up and Down Axis – Resonance Search (EUT)



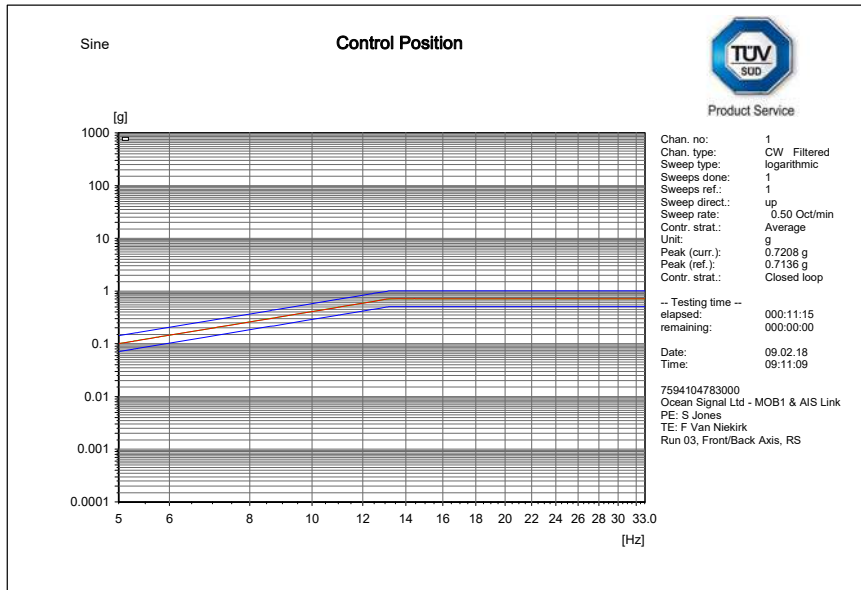
Up and Down Axis – Endurance Run (30 Hz) (Control)



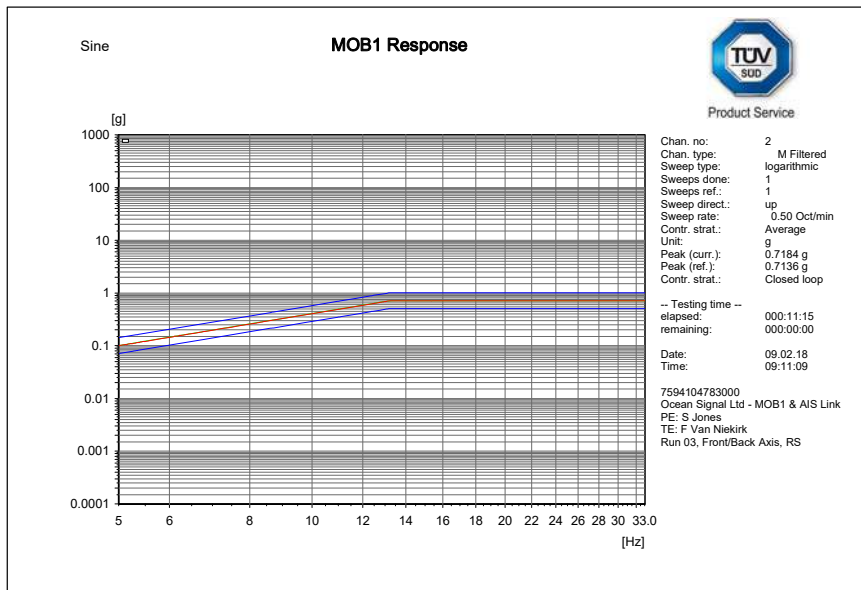
Up and Down Axis – Endurance Run (30 Hz) (EUT)



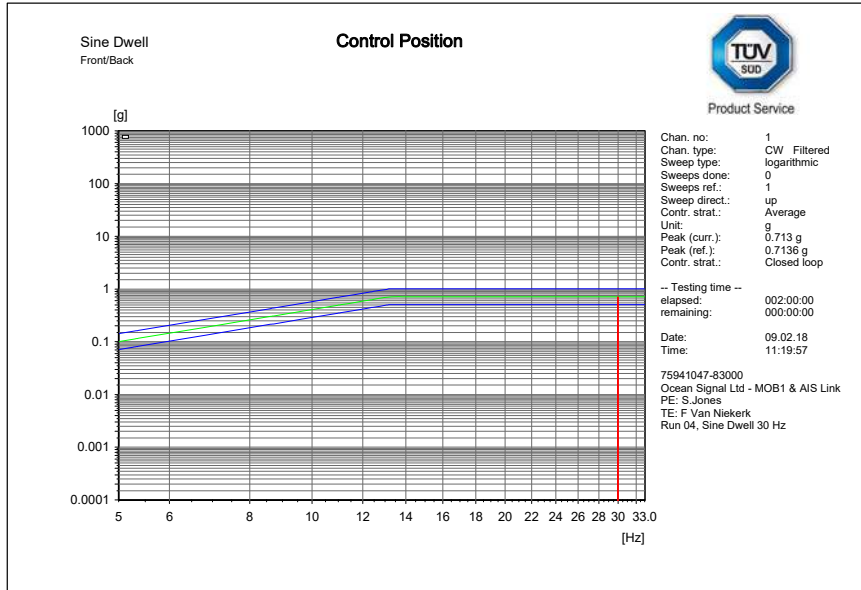
Product Service



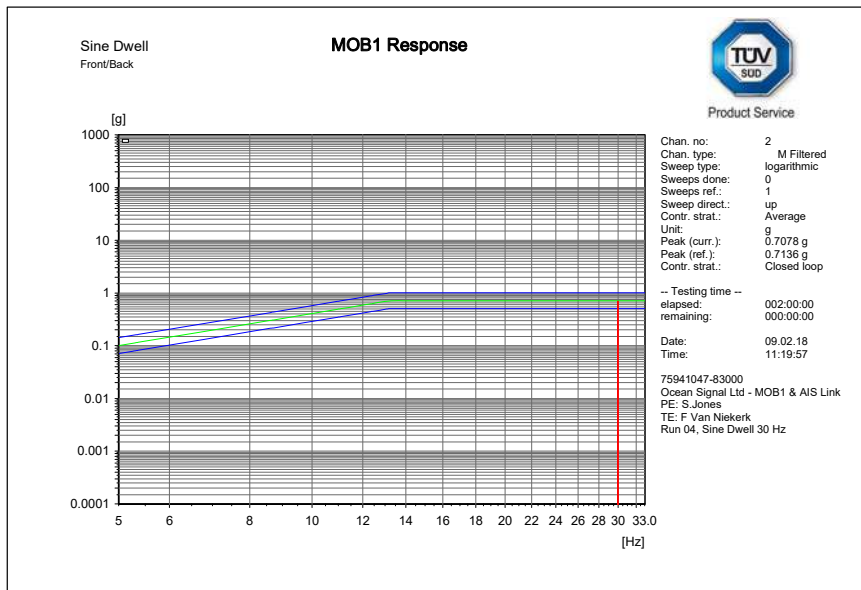
Forward and Aft Axis – Resonance Search (Control)



Forward and Aft Axis – Resonance Search (EUT)



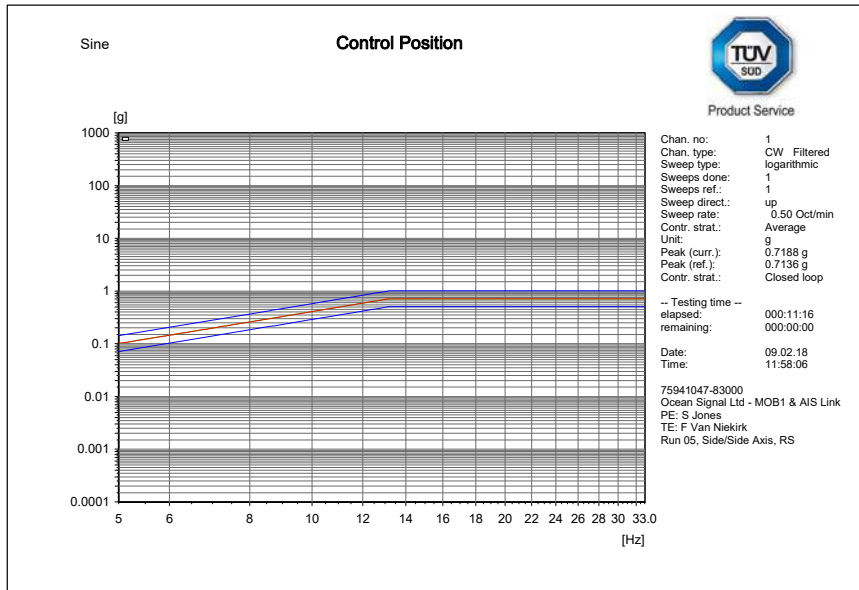
Forward and Aft Axis – Endurance Run (30 Hz) (Control)



Forward and Aft Axis – Endurance Run (30 Hz) (EUT)

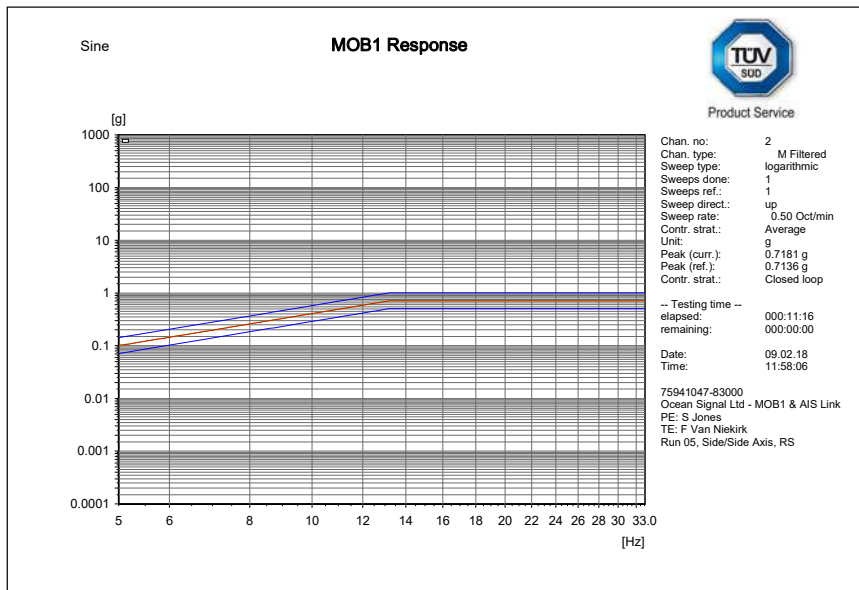


Product Service



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Side to Side Axis – Resonance Search (Control)



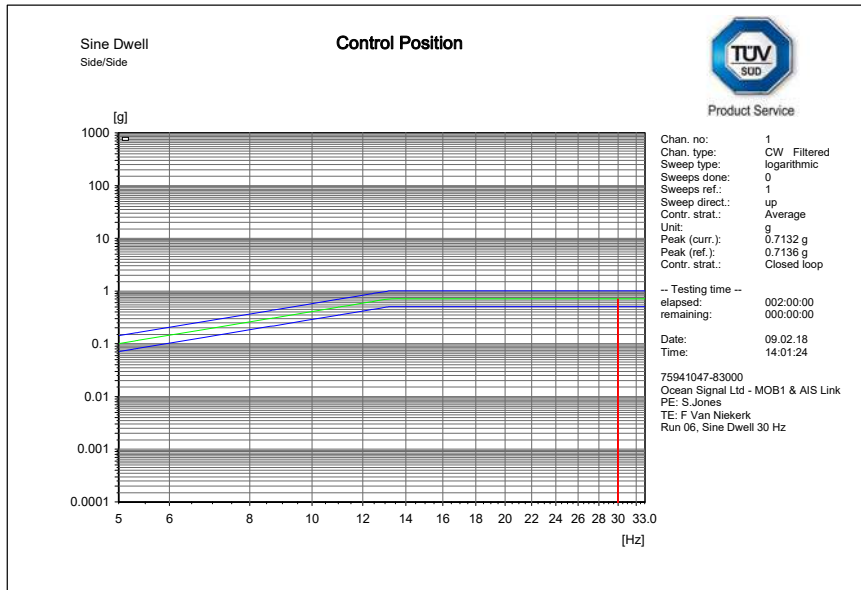
C:\Vcp\NTIDaten\m+pl\Ocean Signal Ltd\75941047-83000\RS\_005.rsn

Side to Side Axis – Resonance Search (EUT)



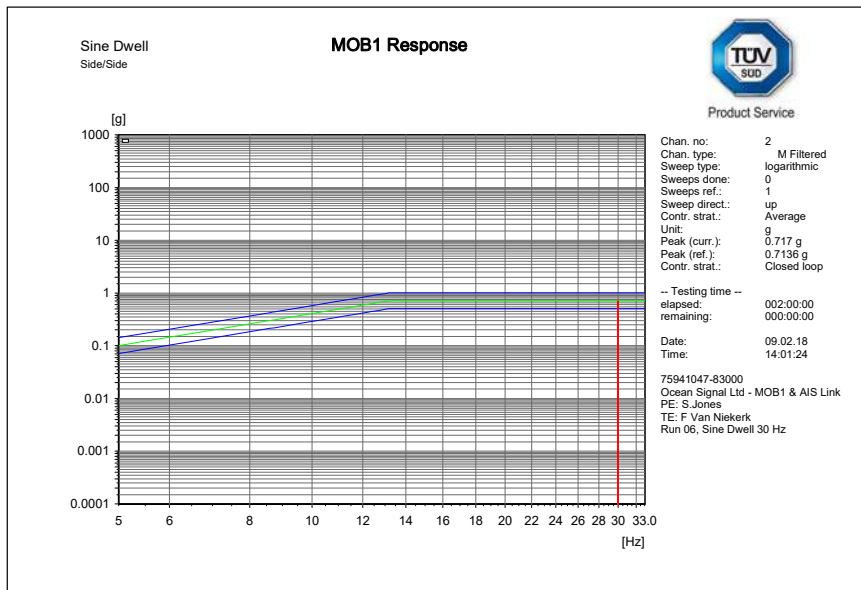


Product Service



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Side to Side Axis – Endurance Run (30 Hz) (Control)



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Side to Side Axis – Endurance Run (30 Hz) (EUT)



Product Service

**2.8.8 Test Results**

Performance Check Results

| Parameter                          | Units | Result | Limit |
|------------------------------------|-------|--------|-------|
| Successful reception of Message 1  | Y / N | Y      | Y     |
| Successful reception of Message 14 | Y / N | Y      | Y     |

| Parameter                                     | Units | Result | Limit |
|---|-------|--------|-------|
| Successful reception of DSC Message 972001071 | Y / N | Y      | Y     |

Mechanical Inspection

Post-test, no signs of mechanical degradation were witnessed.

Activation Monitoring

During the test the EUT was monitored for signs of activation, none was found.



Product Service

**2.9 RAIN AND SPRAY****2.9.1 Specification Reference**

RTCM 110901.1, Clause 8.1.5.2

**2.9.2 Equipment Under Test and Modification State**

RescueME MOB1, MMSI 972001071 (TSR0001) and Mod State 0

**2.9.3 Date of Test**

13 February 2018

**2.9.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

**2.9.5 Environmental Conditions**

Ambient Temperature 6 °C  
Relative Humidity 79.2%

**2.9.6 Test Method**

The EUT was sprayed with 3.5% salt solution for 10 minutes. The EUT was sprayed from a distance of 300mm with a flow rate of 10 litres/ minutes.



**2.9.7 Test Setup**



Test Set Up

**2.9.8 Test Results**

Examination

On completion of the test, the EUT was inspected for signs of water ingress; none was found.

Performance Check Results

| Parameter                          | Units | Result | Limit |
|------------------------------------|-------|--------|-------|
| Successful reception of Message 1  | Y / N | Y      |       |
| Successful reception of Message 14 | Y / N | Y      |       |

| Parameter                                     | Units | Result | Limit |
|---|-------|--------|-------|
| Successful reception of DSC Message 972001071 | Y / N | Y      | Y     |



Product Service

**2.10 IMMERSION****2.10.1 Specification Reference**

IEC 60945, Clause 8.9.3  
BS EN 60529 IPX 7

**2.10.2 Equipment Under Test and Modification State**

RescueME MOB1, MMSI 972001071 (TSR0001) and Mod State 0

**2.10.3 Date of Test**

14 February 2018

**2.10.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

**2.10.5 Environmental Conditions**

Ambient Temperature 25.4 °C  
Relative Humidity 32.2 %

**2.10.6 Test Method**

The EUT was completely submerged in a vessel of water to a depth of 1m for a duration of five minutes.



**2.10.7 Test Setup**



Test Setup

**2.10.8 Test Results**

Examination

On completion of the test, the EUT was inspected for signs of water ingress; none was found.

Performance Check Results

| Parameter                          | Units | Result | Limit |
|------------------------------------|-------|--------|-------|
| Successful reception of Message 1  | Y / N | Y      | Y     |
| Successful reception of Message 14 | Y / N | Y      | Y     |

| Parameter                                     | Units | Result | Limit |
|---|-------|--------|-------|
| Successful reception of DSC Message 972001072 | Y / N | Y      | Y     |



Product Service

**2.11 SOLAR RADIATION**

**2.11.1 Specification Reference**

IEC 60945, Clause 8.10

See Manufacturer Materials Waiver and Declarations – Annex A.



Product Service

**2.12 OIL RESISTANCE**

**2.12.1 Specification Reference**

IEC 60945, Clause 8.11

See Manufacturer Materials Waiver and Declarations – Annex A.





Product Service

**2.13 CORROSION (SALT MIST)**

**2.13.1 Specification Reference**

IEC 60945, Clause 8.12

See Manufacturer Materials Waiver and Declarations – Annex A.



## **2.14 COMPASS SAFE DISTANCE**

### **2.14.1 Specification Reference**

IEC 60945, Clause 11.2

### **2.14.2 Equipment Under Test and Modification State**

RescueME MOB1, MMSI 972001071 (TSR0001) and Mod State 0

### **2.14.3 Date of Test**

27 February 2018

### **2.14.4 Environmental Conditions**

|                     |       |
|---------------------|-------|
| Ambient Temperature | 0°C   |
| Relative Humidity   | 23.2% |

### **2.14.5 Test Method**

A wooden table aligned E-W was used with a compass set in the centre, aligned to read zero. The table was marked to give a graduated scale of distance. The EUT was moved towards the compass until a standard deviation of  $0.3^\circ$  was obtained.

Each orientation of the EUT was tested in this manner with the measurement distance between the compass centre and the EUT being noted.

The test was repeated with readings taken when the compass gave a steering deviation of  $0.9^\circ$ .

The local area Magnetic Flux density (H) at the site of testing was 19.91uT.

The above testing was performed three times with the EUT as follows:

- a. Unpowered.
- b. Normalised.
- c. Power applied.

Prior to performing the tests in accordance with part b above, the EUT was normalised by placing it into Helmholtz Coil Assembly and subjecting it to a magnetic field of 79 A/m.

The test was applied in accordance with the test method requirements of IEC 60945.



Figure 2.14.1 – Test Setup

**2.14.6 Test Results**

|                                      |     |
|--------------------------------------|-----|
| Standard Compass safe distance (mm)  | 400 |
| Emergency Compass safe distance (mm) | 300 |

|   |             |         |
|---|-------------|---------|
| Horizontal maximum flux density, Magnetic North (H) | H           | 19.78   |
| Standard compass deviation limit (degrees)          | $5.4/H = A$ | A = 0.3 |
| Emergency compass deviation limit (degrees)         | $18/H = B$  | B = 0.9 |

| Orientation of the EUT(server) | Un-powered State                                   |  | Normalised   |  | Powered Up   |  |
|--------------------------------|--|--|--|--|--|--|
|                                | Distance from Compass Centre (mm) at A° deflection | Distance from Compass Centre (mm) at B° deflection | Distance from Compass Centre (mm) at A° deflection | Distance from Compass Centre (mm) at B° deflection | Distance from Compass Centre (mm) at A° deflection | Distance from Compass Centre (mm) at B° deflection |
| Front                          | 400  | 230  | 370  | 260  | 360  | 260  |
| Top                            | 240  | 170  | 170  | 170  | 220  | 170  |
| Left Hand Side                 | 340  | 210  | 320  | 220  | 270  | 170  |
| Right Hand Side                | 210  | 170  | 240  | 170  | 240  | 170  |
| Underside                      | 340  | 240  | 400  | 240  | 300  | 220  |
| Rear                           | 320  | 230  | 210  | 170  | 260  | 220  |



Product Service

**2.15 BUOYANCY TEST**

**2.15.1 Specification Reference**

RTCM 11901.1, Clause 8.1.3

Not tested – EUT does not float.



Product Service

**2.16 CONTROLS AND INDICATORS TESTS (NUA)**

**2.16.1 Specification Reference**

RTCM 11901.1, Clause 8.1.4

**2.16.2 Equipment Under Test and Modification State**

RescueME MOB1, MMSI 972001071 (TSR0001) (including labelling) and Mod State 0  
User Manual: V1.04 23/10/2017 (unless indicated otherwise in the table below)

**2.16.3 Date of Test**

15 February 2018 – 12 March 2018

**2.16.4 Test Equipment Used**


The major items of test equipment used for the above tests are identified in Section 3.1.











**2.16.5 Test Results**

| <b>Controls and Indicators (including Annex E requirements for AIS type MSLD devices)</b> |   |   |
|---|---|---|
| <b>Clause 4.1 AU Controls and Indicators</b>  |   |   |
| Sub clause  | Statement   | Comment   |
| 4.1   | All AU controls and indicators shall be: <ul style="list-style-type: none"> <li>• clearly and durably marked</li> <li>• designed to prevent inadvertent activation</li> </ul> | Various labels are affixed to the EUT plastic body and other markings are printed directly onto the various hard plastic enclosure parts, and membrane buttons of the EUT. These markings are clearly visible and provide guidance as to how to operate the EUT.<br><br>To prevent inadvertent activation the EUT has been designed such that manual activation requires two steps. |
|   | All AU controls and indicators should be: <ul style="list-style-type: none"> <li>• few in number</li> <li>• kept simple to permit ease of operation.</li> </ul>               | The EUT controls are limited to the following:<br>ARM (Pull down)<br>Activate (slide across)<br>Test (also the off function)  |



|  |  |   |
|--|--|---|
|  | <p>The written instructions provided to operate the device are few in number and provide arrows with the written instructions indicating the direction of movement required.</p>   | <p>The following pictorial instructions are presented on the EUT:</p>                 |
|  | <p>The various modes of the controls should be readily apparent by visual observation.</p>   | <p>The labelling and markings are predominately black text on a white background, white text on a grey background. The "T" button is black text on a grey background.</p> |
|  | <p>AUs shall be designed for manual activation.</p>  | <p>The EUT is capable of manual activation.</p>   |
|  | <p>AUs should be designed for both manual and automatic activation.</p>  | <p>The EUT is capable of manual activation and activation by means of the lifejacket activation.</p>  |
|  | <p>Not less than two simple, independent actions shall be required for manual activation of the AU.</p> <p>Examples of independent actions include protection of a switch by a removable cover, or two independent switches.</p> | <p>The EUT has been designed such that manual activation requires two steps. Firstly, moving the red arm cap to the lower position then slide the grey cap sideways.</p>  |



|  |   |   |
|--|---|---|
|  | <p>All AU controls necessary for the correct operation of the AU shall be so designed that personnel wearing appropriately sized 5mm or more neoprene gloves can activate the AU.</p> | <p>Manual activation was simple and possible whilst wearing neoprene gloves.</p>  |
|  | <p>A positive visual and/or audible indication that the AU is activated shall be provided.</p>  | <p>On activation the EUT LED flashes green and the strobe light activates.</p> <p>The User Guide describes the following:</p> <p><b>5.1 Automatic Activation</b></p> <p>When correctly packed in a lifejacket the MOB1 will automatically activate when the lifejacket inflates. Should the lifejacket fail to fully inflate, it may be necessary to assist the Activation Slide by pulling on the Activation Tape to fully release the Activation Slide.</p> <p><b>5.2 Manual Activation</b></p> <ul style="list-style-type: none"> <li>  Only activate your MOB1 in situations requiring assistance ONLY in an emergency. Deliberate misuse of your MOB1 may result in a fine.         </li> <li>  To manually activate your MOB1 in an emergency, slide the red Arming Slide down. Slide the grey Activation Slide to the Left or Right.         </li> <li>  The antenna will be automatically released. Keep the MOB1 well away from your eyes when activating.         </li> <li>  The strobe light will start flashing. The MOB1 will automatically start transmitting after 15seconds.         </li> <li>  If the MOB1 fails to activate when the slide is removed, press the ON Key down until the green LED starts flashing. Release the key.         </li> <li>  Upon activation, the indicator LED will show eight short flashes during AIS transmission and one long flash during DSC transmission. The colour of the flash will be Red during position acquisition and green when the GPS position is being received.         </li> <li>  When operating the MOB1, tether the beacon to your body or the life jacket.         </li> <li>  Hold your beacon with the antenna standing vertically. Keep the area marked 'Do not obstruct when armed' on the red arming slider free from obstruction, which would interfere with the GPS reception. Covering this area will interfere with the GPS reception.         </li> </ul> |





Product Service

|       |  |  |
|-------|--|--|
| 4.1.1 | User controls for AUs with only manual activation  |  |
|       | <p>AUs provided with only manual activation shall have as a minimum, clearly marked integral manual controls to operate the device in the following modes:</p> <p>ON<br/>In the ON mode, the AU is manually activated.</p> <p>TEST<br/>See paragraph 4.2.</p> <p>OFF<br/>In the OFF mode, the AU is deactivated.</p> | <p>EUT is manual only device is marked for two manual modes off and alert (on)</p> <p>Test function is possible once in- armed mode.</p> |



|       |  |  |
|-------|--|--|
| 4.1.2 | User Controls for AUs with both manual and automatic activation  |  |
|       | <p>AUs provided with both automatic and manual activation shall have, as a minimum, clearly marked integral manual controls to operate the device in the following modes:</p> <p><b>READY or ARMED</b><br/>In the READY or ARMED mode, the AU is normally deactivated, but automatically activates when the unit experiences an alerting condition as defined in Section 3.2. Once activated the unit should remain activated until it is switched to the OFF position or manually reset to the READY or ARMED mode.</p> <p><b>ON</b><br/>In the ON mode, the AU is activated continuously, regardless of whether in or out of the water. This function must be provided by a separate mechanism in addition to the automatic actuator provided in the READY or ARMED mode. It is not sufficient to require the user to short the water contacts (or otherwise simulate automatic activation) for the function of manual activation.</p> <p><b>TEST</b> See paragraph 4.2.</p> <p><b>OFF</b><br/>In the OFF mode, the AU is deactivated.</p> | <p>The EUT has manual mode only, there is one action to arm the device and one action to activate the device.</p> <p>Automatic activation only by inflation of the lifejacket.</p> <p>Test mode activated by long actions.</p> <p>Off mode needs a longer activation.</p>                            |
| 4.1.3 | Function of the ON control   |  |
|       | <p>Transmission of the alert signal shall begin within 30 seconds of switching the control to the ON position. Consideration should be given to delaying transmission of the alert for some initial period not to exceed 30 seconds, to allow users to deactivate the device in the case of an inadvertent activation.</p>   | <p>The EUT activates after 15 seconds.</p>   |
| 4.1.4 | Indicators, Alerting   |  |
|       | <p>A visual and/or audible indicator detectable by the user shall commence within 5 seconds of the device being activated (both manually and/or automatically), and shall continue until the AU is no longer transmitting its alerting signal. The visual indicator should be visible in direct sunlight, low light, and no light conditions.</p> <p>The audible indicator should have a distinctive alarm tone with a minimum sound output of 85 dBA when measured 10 cm from the AU.</p>   | <p>The LED indications and strobe light continue to operate until the EUT is deactivated by the user. Indications cease once the EUT is switched off.</p> <p>The visual indicators were not confirmed in direct sunlight, low light or no light conditions.</p> <p>Audible indicator not tested.</p> |



| 4.1.4.2   | Self-test                 | <p>The EUT has three self-test options as described by the Manufacturer in the user manual:</p> <ol style="list-style-type: none"> <li>1. Functional test: this test acts as an electronic witness that the device has been operated. Further combinations of Green / Amber / Red LED indications indicate the number of hours used and failure information.</li> <li>2. DSC transmission test.</li> <li>3. AIS transmission test.</li> </ol> <p>All three test features are initiated in the same way and conclude with a specific LED sequence which details the pass / fail status and further failure information. The user manual states that the LED will provide indication that the self test is in progress.</p> <table border="1" data-bbox="1077 662 1559 933"> <thead> <tr> <th colspan="2">Green / Amber Indicator.<br/><i>Changes to Amber after 1 hour of use</i></th> <th>Red indicator status</th> </tr> <tr> <th>No of Flashes</th> <th>No of Hours Used</th> <th>Type of Failure</th> </tr> </thead> <tbody> <tr> <td rowspan="2">1 Flash</td> <td>0 to 1hr (Green)</td> <td rowspan="2"></td> </tr> <tr> <td>1 to 2hrs (Amber)</td> </tr> <tr> <td>2 Flashes</td> <td>2 to 4hrs (Amber)</td> <td>Frequency generation</td> </tr> <tr> <td>3 Flashes</td> <td>4 to 6hrs (Amber)</td> <td>Transmit Power</td> </tr> <tr> <td>4 Flashes</td> <td>6 to 8hrs (Amber)</td> <td>Battery failed</td> </tr> <tr> <td>5 Flashes</td> <td>8 to 10hrs (Amber)</td> <td>No GPS Fix</td> </tr> <tr> <td>6 Flashes</td> <td>Over 10hrs (Amber)</td> <td></td> </tr> </tbody> </table> <p>Table 1: Pass/Fail indication</p> | Green / Amber Indicator.<br><i>Changes to Amber after 1 hour of use</i> |  | Red indicator status | No of Flashes | No of Hours Used | Type of Failure | 1 Flash | 0 to 1hr (Green) |  | 1 to 2hrs (Amber) | 2 Flashes | 2 to 4hrs (Amber) | Frequency generation | 3 Flashes | 4 to 6hrs (Amber) | Transmit Power | 4 Flashes | 6 to 8hrs (Amber) | Battery failed | 5 Flashes | 8 to 10hrs (Amber) | No GPS Fix | 6 Flashes | Over 10hrs (Amber) |  |
|---|---------------------------|---|---|--|----------------------|---------------|------------------|-----------------|---------|------------------|--|-------------------|-----------|-------------------|----------------------|-----------|-------------------|----------------|-----------|-------------------|----------------|-----------|--------------------|------------|-----------|--------------------|--|
| Green / Amber Indicator.<br><i>Changes to Amber after 1 hour of use</i> |                           | Red indicator status  |   |  |                      |               |                  |                 |         |                  |  |                   |           |                   |                      |           |                   |                |           |                   |                |           |                    |            |           |                    |  |
| No of Flashes   | No of Hours Used          | Type of Failure   |   |  |                      |               |                  |                 |         |                  |  |                   |           |                   |                      |           |                   |                |           |                   |                |           |                    |            |           |                    |  |
| 1 Flash   | 0 to 1hr (Green)          |   |   |  |                      |               |                  |                 |         |                  |  |                   |           |                   |                      |           |                   |                |           |                   |                |           |                    |            |           |                    |  |
|   | 1 to 2hrs (Amber)         |   |   |  |                      |               |                  |                 |         |                  |  |                   |           |                   |                      |           |                   |                |           |                   |                |           |                    |            |           |                    |  |
| 2 Flashes   | 2 to 4hrs (Amber)         | Frequency generation  |   |  |                      |               |                  |                 |         |                  |  |                   |           |                   |                      |           |                   |                |           |                   |                |           |                    |            |           |                    |  |
| 3 Flashes   | 4 to 6hrs (Amber)         | Transmit Power  |   |  |                      |               |                  |                 |         |                  |  |                   |           |                   |                      |           |                   |                |           |                   |                |           |                    |            |           |                    |  |
| 4 Flashes   | 6 to 8hrs (Amber)         | Battery failed  |   |  |                      |               |                  |                 |         |                  |  |                   |           |                   |                      |           |                   |                |           |                   |                |           |                    |            |           |                    |  |
| 5 Flashes   | 8 to 10hrs (Amber)        | No GPS Fix  |   |  |                      |               |                  |                 |         |                  |  |                   |           |                   |                      |           |                   |                |           |                   |                |           |                    |            |           |                    |  |
| 6 Flashes   | Over 10hrs (Amber)        |   |   |  |                      |               |                  |                 |         |                  |  |                   |           |                   |                      |           |                   |                |           |                   |                |           |                    |            |           |                    |  |
| 4.1.5   | Water activation function | <p>The optional AU water-activation function should be protected against inadvertent activation from salt-water spray or rain.</p> <p>When installed on a life jacket as per the manufacturer's instructions the EUT will be activated by the expansion of the lifejacket.</p> <p>The EUT does not automatically activate in water via a water sensor.</p>  |   |  |                      |               |                  |                 |         |                  |  |                   |           |                   |                      |           |                   |                |           |                   |                |           |                    |            |           |                    |  |
| 4.2   | Self-test function        |   |   |  |                      |               |                  |                 |         |                  |  |                   |           |                   |                      |           |                   |                |           |                   |                |           |                    |            |           |                    |  |



Product Service

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|--|---|--|
|  | <p>The AU shall include a functional self-test designed to test as a minimum the following items under a full-load condition:</p> <ul style="list-style-type: none"> <li>• battery, and</li> <li>• RF output</li> </ul> <p>The self-test shall be functional throughout the operating temperature range.</p> <p>The manufacturer shall verify at the minimum: ambient and maximum operating temperatures, that the self-test pass/fail indicator(s) correctly identifies(y) any failure condition that has been detected by any of the self-test functions.</p> | <p>There are two self-test functions – see 4.1.4.2 above. The full function test, when a GPS fix is achieved, provides a MOB test transmission.</p> <p>See also section 2.17 for test of the Self Test Mode.</p> <p>The Manufacturer advised that “that the MOB1 correctly indicates any failure that has been detected by any of the self-test functions at minimum, ambient and maximum temperatures.”</p> |
|--|---|--|



Product Service

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|-------|--------------------------|--|
| 4.2.1 | <b>Battery self-test</b> | <p>The manufacturer shall verify during the battery self-test: ambient and maximum operating temperatures, that the AU battery experiences full-load current drain.</p> <p>The battery self-test shall indicate when the battery is no longer capable of providing the minimum operating time.</p> <p>The Manufacturer advised that “that the battery self-test indicates when the battery is no longer capable of providing the minimum operating time and that the battery experiences full load current drain under minimum ambient and maximum temperature.”</p> <p>For self-test functions – see 4.1.4.2 above.</p> |
|-------|--------------------------|--|



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|-------|--|---|--|
| 4.2.2 | RF self-test   |   |  |
|       | <p>The RF self-test shall include the connection of the transmitter to the antenna or an equivalent dummy load.</p> <p>During the self-test function, the AU shall transmit in such a way that it will not cause a distress alert.</p> <p>If the AU includes a 121.5 MHz radio-locating device, the signal transmitted during the self-test should not exceed 3 audio sweeps or 1 second, whichever is greater.</p> <p>The means of activating the self-test feature should prevent the test signal from being continuously activated.</p> | <p>The safety related message transmitted to the antenna during a self-test is MOB TEST. MOB TEST transmissions were received by a Class A AIS device.</p> <p>The EUT does not include a 121MHz transmitter.</p> <p>Continuous press of the test key does not result in continuous test transmissions</p> |  |
| 4.3   | Buoyancy   |   |  |
|       | <p>Unless the AU is intended to be incorporated into a buoyant device, it should have sufficient positive buoyancy to float in fresh water and to operate while floating in fresh or salt water</p>  | <p>Device is not buoyant but attaches to a lifejacket.</p>  |  |
| 4.4   | Environmental factors  |   |  |
|       | <p>The AU shall not be activated accidentally or damaged by:</p> <ul style="list-style-type: none"> <li>a) dry heat</li> <li>b) damp heat</li> <li>c) low temperature</li> <li>d) thermal shock</li> <li>e) drop onto hard surface</li> <li>f) drop into water</li> <li>g) vibration sweep</li> <li>h) water immersion (intrusion into the device)</li> <li>i) solar radiation</li> <li>j) oil contamination</li> <li>k) corrosion</li> </ul>  | <p>See sections 2.2 through to 2.12 of this report.</p>   |  |
|       | <p>The electronic components should be protected to prevent malfunction under prolonged conditions of high humidity, including condensation.</p>   | <p>Not tested.</p>  |  |
| 5     | Construction Requirements  |   |  |
| 5.1   | General  |   |  |
|       | <p>The AU shall be wearable, or arranged to be attached to the user's clothing or Personal Floatation Device (PFD) without interfering with the user's activities. The AU should be provided with adequate means of attachment to the user in its "operational" position.</p>  | <p>The EUT is supplied with a clip to attach to the inflation tube of the PFD and a ribbon to activate the EUT on inflation, this is all housed within the PFD cover.</p>   |  |



|       |  |  |
|-------|--|--|
|       | The AU should be designed for "hands free" operation, so that the user is not required to hold the unit out of the water for operation after activation.   | The EUT, when installed on a lifejacket as per the Automatic Activation conditions in the user manual would not require the user to hold it (implied). The position of the EUT with respect to the victim and water will be dependent on the type of PFD used.<br><br>The user guide provides specific instructions for manual activation which include holding the beacon with the antenna standing vertically. |
|       | The external design of the AU should avoid sharp edges or points to prevent injury or damage to equipment.   | A sharp edge test finger was applied to the EUT and no sharp edges were observed.  |
| 5.2   | Battery  |  |
|       | The AU shall have its own battery or batteries and should not depend upon any external source of power for its operation when activated. The batteries shall be an integral part of the equipment.   | The EUT is battery powered and the batteries are an integral part of the EUT.  |
| 5.2.1 | Battery hazards  |  |
|       | The AU shall not be hazardous to personnel handling it, operating it, or performing manufacturer-approved servicing of it nor shall it release toxic or corrosive products outside the AU case:<br><br>a) during or subsequent to storage at temperatures between -55C and +75C;<br>b) during a full or partial discharge at any rate up to and including an external short circuit;<br>c) during a charge or forced discharge of a cell or cells by another cell or cells within the battery;<br>and<br>d) after a full or partial discharge. | The Manufacturer states the battery is a sealed unit and is replaced as per the date on the label or after any use, batteries should only be replaced by authorised dealer.<br><br>See Annex A for Manufacturer supplied battery test data.  |
|       | All AUs should be safe with respect to reversal of polarity, shorting, and the effects of self-heating, cell-to-cell charging, and forced discharging.   | The EUT battery pack is a shrink-wrapped component and the battery connector is keyed preventing incorrect connection to the EUT.  |



|       |   |  |
|-------|---|--|
| 5.2.2 | Battery life for primary battery  | <p>The AU manufacturer should establish a useful life and an expiration date for primary (non-rechargeable) batteries. The useful life is the period of time after the date of battery manufacture that the battery will continue to meet the input power requirements of the MSLD system (as defined in the appropriate Annex), over the entire specified operating temperature range. The following losses must be included (at a temperature of +20 C ± 5 C):</p> <p>a) Testing, as recommended by the manufacturer or as required by the regulatory authority, whichever is the more demanding.<br/>                 b) Self-discharge of the battery pack.<br/>                 c) Standby loads, including any current drain in the READY mode of an AU.</p> <p>The battery replacement date marked on the AU should be the date of battery installation in the AU plus no more than 50% of the rated life of the battery, provided that the battery cells are no older than 25% of the rated life of the battery.</p> |
| 5.2.3 | Battery replacement   | <p>A field for the battery expiry date is provided on the side label of the EUT.</p> <p>Manufacturer provided report on useful battery life and cell / battery data – see Annex A.</p>   |
| 5.3   | Labelling   |  |
| 5.3.1 | Battery   | <p>Replacement of the battery, if user-replaceable, should be possible with relative ease, and any interface connections required should be such as to prevent reversed polarity or incorrect installation. Provision should be made to ensure watertight integrity upon replacement of the battery.</p> <p>The user documentation advises that the battery pack should only be replaced by an Ocean Signal authorised battery replacement centre.</p>   |
|       | The MSLD documentation should include instructions on AU battery replacement intervals.   | <p>The user documentation details the self-test function which shows battery usage, if over 1hrs usage then self-test function has been exceeded and batteries should be replaced</p>  |
|       | All batteries in the AU and BU (if used) should use polarized connectors or wires to battery connectors uniquely color coded. The wire to the most positive (+) terminal should be RED; the wire to the most negative (-) terminal should be BLACK. YELLOW, GREEN, and/or BLUE color coding (if used) should be used for wires connecting intermediate voltage levels in multi-voltage battery packs. | <p>The user documentation advises that the battery pack should only be replaced by manufacturer or a manufacturer authorised battery replacement centre.</p> <p>The battery pack connector is polarised, allowing fitting in one orientation only. The cables from the battery pack are red and black.</p>   |





|       |                                 |   |
|-------|---------------------------------|---|
| 5.3.2 | Identification and instructions | <p>Abrasion resistance - See Manufacturer Materials Wavier and Declarations (Annex A).</p> <p>For point a) see points 4.1.1 and 4.1.2 above.</p> <p>There is a 'T' button with the word 'Off' adjacent to this.</p> <p>There are no self-test instructions on the EUT labelling. Apart from the 'T' (for test). The user manual details the test / off button which is identified on the EUT by the 'T'.</p> <p>The Manufacturer name (Ocean Signal) is identifiable on the EUT.</p> <p>The Manufacturer address is provided on the EUT (revised details as provided 07 March 2018).</p> <p>The AU type is identifiable on the EUT (Model: MOB1).</p> <p>Fields are provided on the EUT for the EUT serial number and MMSI.</p> |
|-------|---------------------------------|---|



|  |   |
|--|---|
| <p>All labelling on the exterior of the AU shall be resistant to deterioration by prolonged exposure to sunlight, and shall not be unduly affected by seawater or oil, and shall be abrasion resistant. The outside of the AU shall be marked indelibly and legibly with the following:</p> <p>...</p> <ul style="list-style-type: none"> <li>f) Battery safety warning and disposal statement, if applicable.</li> <li>g) Storage and operating temperature range of the AU.</li> <li>h) Regulatory authority markings, if required.</li> <li>i) Compass safe distance.</li> <li>j) Warning to only activate device in an emergency.</li> <li>k) If a GNSS receiver is included, a warning to not block the antenna.</li> </ul> | <p>Brief battery safety warnings are provided on the EUT (Do not recharge, incinerate or short circuit).</p> <p>The storage temperature range of the EUT is provided on the EUT.</p> <p>The operating temperature range of the EUT is provided on the EUT revised details as provided 07 March 2018).</p> <p>The following markings were visible of the EUT:<br/>                 FCC ID,<br/>                 IC ID<br/>                 CE number</p> <p>The compass safe distance value was provided on the EUT.</p> <p>The warning note was provided on the EUT (WARNING: USE ONLY IN EMERGENCY).</p> <p>The warning "Do not obstruct when armed" is provided in the location of the GNSS antenna.</p> <div data-bbox="1102 791 1406 1091" data-label="Image"> </div> |
|--|---|



|   |               |   |
|---|---------------|---|
| 7 | Documentation | <p>The manufacturer shall provide an operation manual including the following:</p> <ul style="list-style-type: none"> <li>a) Intended use of the MSLD system.</li> <li>b) Complete instructions for testing and operating the MSLD system.</li> <li>c) Information explaining the BU and LF system compatibility requirements.</li> <li>d) Cautions and recommendations to prevent false alarms.</li> <li>e) General battery information (e.g., battery replacement instructions, battery type, safety information regarding battery use and disposal).</li> <li>f) Information on when battery replacement is required.</li> </ul> <p>The user documentation states the following:</p> <ul style="list-style-type: none"> <li>a) The MOB1 is intended to alert your vessel in the event that you fall overboard. Furthermore it is noted that the Man Over Board AIS transmitter is only intended for short range signalling to an AIS receiver installed onboard your own vessel. It will not directly alert the emergency services or any other vessels.</li> <li>b) Instructions for operation and self test are provided.</li> <li>c) Details of the display of MOB message reception via AIS enabled plotters are provided (user manual revised details as provided 07 March 2018).</li> <li>d) Cautions to prevent accidental activation are provided (user manual revised details as provided 07 March 2018).</li> <li>e) Battery information including replacement information, disposal, battery type and transportation information.</li> <li>f) Battery replacement information (based on use or prior to expiry date on EUT).</li> </ul> |
|---|---------------|---|











|         |  |   |
|---------|--|---|
|         | <p>The manufacturer shall provide an operation manual including the following</p> <p>...</p> <p>g) Information related to the requirements of preventive maintenance.</p> <p>h) Minimum operating life time, operating, and stowage temperature ranges.</p> <p>i) Information explaining the requirement and procedure for licensing and registering MSLDs, as appropriate.</p> <p>j) Information relating to the shipment of the MSLD.</p> <p>k) Instructions on actions to be taken in the case of false alarms.</p> <p>NOTE: In the case of accidental activation involving transmission of a 121.5 MHz signal, the user should deactivate the MSLD and notify the appropriate search and rescue authorities (e.g., U.S. Coast Guard or Rescue Coordination Center serving the geographic area) at the earliest possible time.</p> <p>l) If a 121.5 MHz signal is transmitted during the self-test, information noting that the self-test should be performed only within the first 5 minutes of any hour and should not exceed 3 audio sweeps or 1 second, whichever is longer.</p> <p>m) A warning to the effect that the device should only be activated in an emergency.</p> <p>n) Instructions for fitting / attaching the AU to the user and for correct operation in the water in an emergency.</p> <p>o) Instructions for BU installation, testing, use, and maintenance.</p> | <p>The user documentation contains the following</p> <p>g) Preventative maintenance: "Your MOB1 will require little maintenance except periodic cleaning, if required"</p> <p>h) Operating life time, (user manual revised details as provided 07 March 2018) and operating and stowage temperatures</p> <p>i) Licencing information is provided (user manual revised details as provided 07 March 2018)</p> <p>j) Shipment information is detailed</p> <p>k) False alarm and steps to take if this occurs (user manual revised details as provided 07 March 2018)</p> <p>l) Not applicable – EUT does not support 121.5 MHz transmission</p> <p>m) Only to activate in emergency</p> <p>n) Installation on life jacket detailed</p> <p>o) Not applicable – EUT is an AU only (therefore no BU information is provided)</p> |
| 8.1.4.2 | Controls durability  |   |
|         | All manual controls should be operated for at least 500 cycles, without failure of the mechanism   | Not tested  |



Product Service

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|---------|---|--|
| Annex E | AIS Type MSLD Systems   |  |
| E.3.1   | Operating time  |  |
|         | The AU shall operate for a minimum of 12 hours.   | The battery capacity test was run and the EUT operated for 24 hours. See section 2.19.   |
| E.3.2   | Interoperability  |  |
|         | The AU should be capable of communicating with nearby vessels by transmitting an ITU-R M.1371-4 Annex 9 compliant Burst Transmission. | The Manufacturer advised the following "Compliance to ITU-R.1371-4 Annex 9 demonstrated by report already submitted to FCC as part of original approval." The intention of this report therefore is to demonstrate the EUT functional operation after each environmental test. |



|       |                       |   |
|-------|-----------------------|---|
| E.3.3 | Operational functions | <p>See sections 4.1.1 and 4.1.2 of this table.</p> <p>The User Guide provides the following information:</p> <p><b>5.1 Automatic Activation</b></p> <p>When correctly packed in a lifejacket the MOB1 will automatically activate when the lifejacket inflates. Should the lifejacket fail to fully inflate, it may be necessary to assist the Activation Slide by pulling on the Activation Tape to fully release the Activation Slide.</p> <p><b>5.2 Manual Activation</b></p> <ul style="list-style-type: none"> <li>  Only activate your MOB1 in situations requiring assistance ONLY in an emergency. Deliberate misuse of your MOB1 may result in a fine.         </li> <li>  To manually activate your MOB1 in an emergency, slide the red Arming Slide down. Slide the grey Activation Slide to the Left or Right.         </li> <li>  The antenna will be automatically released. Keep the MOB1 well away from your eyes when activating.         </li> <li>  The strobe light will start flashing. The MOB1 will automatically start transmitting after 15seconds.         </li> <li>  If the MOB1 fails to activate when the slide is removed, press the ON Key down until the green LED starts flashing. Release the key.         </li> <li>  Upon activation, the indicator LED will show eight short flashes during AIS transmission and one long flash during DSC transmission. The colour of the flash will be Red during position acquisition and green when the GPS position is being received.         </li> <li>  When operating the MOB1, tether the beacon to your body or the life jacket.         </li> <li>  Hold your beacon with the antenna standing vertically. Keep the area marked 'Do not obstruct when armed' on the red arming slider free from obstruction, which would interfere with the GPS reception. Covering this area will interfere with the GPS reception.         </li> </ul> <p>RF self-test burst requirements not tested.</p> |
|-------|-----------------------|---|



|       |                             |   |
|-------|-----------------------------|---|
| E.3.4 | Unique identifier (user ID) | <p>The AIS MSLD AU shall have a unique identifier to ensure the integrity of the VHF data link.</p> <p>The user ID for an AIS MSLD AU is 972xyyyy, where xx = manufacturer ID 01 to 99;5 yyyy = the sequence number 0000 to 9999. This reverts to 0000 once 9999 has been reached.</p> <p>The manufacturer ID xx = 00 is reserved for test purposes. The unique identifier used for the purposes of type approval to this standard shall be in the format 97200yyyy.</p> <p>After being programmed by the manufacturer, it shall not be possible for the user to change the unique identifier of the AIS MSLD AU. The configuration method for the unique identifier shall be as defined by the manufacturer and shall be held in non-volatile memory.</p> <p>The Manufacturer has advised the following details regarding AIS user ID generation:</p> <p>Ocean Signal MSLD devices are programmed with the MMSI of the format 972 60 yyyy.</p> <p>The Manufacturer also stated that the user cannot change the MMSI via the supplied software.</p> <p>See also E3.5.</p> |
|-------|-----------------------------|---|



|       |                                      |   |
|-------|--------------------------------------|---|
| E.3.5 | AIS and DSC Combination MSLD Devices | <p>The limited testing with this test report demonstrated that a common AIS and DSC user ID were transmitted (MMSI). See also E3.4.</p> <p>No checks were made to determine the schedule / priority transmission rules, see the Manufacturer advises the following:<br/> <i>"The MOB1 code is configured that if a conflict occurs between the AIS and DSC messages the AIS message will take priority and the DSC message will be delayed"</i></p> |
| E.3.6 | Battery                              | <p>The EUT contains a lithium metal battery pack.</p> <p>The user manual indicates that this should be replaced by an authorised battery replacement centre only.</p>   |
| E.3.7 | Output Power                         | <p>The nominal radiated power (EIRP) of the AIS MSLD AU shall be 1 W.</p> <p>Not tested</p>   |
| E.3.8 | Transmission Performance             | Not tested  |
| E.3.9 | Position Source and Data             |   |





|         |  |   |
|---------|--|---|
|         | <p>A GNSS receiver shall be used as the source for AIS MSLD AU position reporting.</p> <p>The GNSS receiver shall meet the following requirements of IEC 61108: position accuracy, acquisition, re-acquisition, receiver sensitivity, RF dynamic range, position update, effects of specific interfering signals but with a minimum update of once per minute, provide a resolution of one ten-thousandth of a minute of arc and use WGS 84 datum.</p> <p>The manufacturer shall provide evidence that an internal GNSS device cold start is forced at every AIS MSLD AU activation (cold start refers to the absence of time dependent or position dependent data in memory, which might affect the acquisition of the GNSS position).</p> <p>On activation, if the GNSS receiver is unable to provide a valid position fix, then the reported position shall be longitude = 181° = not available = default and latitude = 91° = not available = default, COG = not available = default, SOG = not available = default, and the time stamp field shall be set to a value of 63.</p> <p>If the GNSS data is lost then the AIS MSLD AU shall continue to transmit with the last known position, COG and SOG, and the time stamp field shall be set to a value of 63 "positioning system inoperative" and with the synchronization state set to 3.</p> | <p>See Annex A for Manufacturer supplied test data: PC TC Omega test report 14/509, IEC61108 test report for EPIRB1.</p>  |
| E.4     | Technical Characteristics  | Not tested  |
| E.5     | Documentation  |   |
|         | <p>The documentation requirements of Section 7 of this standard are replaced by the following:</p> <p>"General instructions advising the user of the AU what to expect to see on the BU in both the normal and test modes of operation."</p>   | <p>The EUT is an AU (Annex E of RTCM 11901.1), and the user documentation provides brief details as to how the MSLD would be displayed on a BU in self-test mode and active mode (revised details as provided 07 March 2018).</p> |
| E.6     | Performance Tests  | Not tested  |
| E.7     | Performance Radio Tests  | Not tested  |
| E.8     | Link Layer   | Not tested  |
| Annex F | Internal Navigation Device   | See section 2.18 of this report.  |



Product Service

## 2.17 TEST OF THE SELF-TEST MODE

### 2.17.1 Specification Reference

RTCM 11901.1, Clause 8.1.6

### 2.17.2 Equipment Under Test and Modification State

RescueME MOB1, MMSI 972001071 (TSR0001) and Mod State 0

### 2.17.3 Date of Test

29 January 2018

### 2.17.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.17.5 Environmental Conditions

Ambient Temperature 24.1°C - 24.9°C

Relative Humidity 40.8% - 41.5%

### 2.17.6 Test Results

| Test Conditions            | Self-test |                             |                                |
|----------------------------|-----------|-----------------------------|--------------------------------|
|                            | Battery   | GPS<br>(with GPS available) | GPS<br>(without GPS available) |
| T <sub>nom</sub> (20.0°C)  | Pass      | Pass                        | Pass                           |
| T <sub>min</sub> (-20.0°C) | Pass      | Pass                        | Pass                           |
| T <sub>max</sub> (+55.0°C) | Pass      | Pass                        | Pass                           |

#### Limit Clause 8.1.6

The self-test should be performed successfully at the minimum operating temperature (or colder), at the ambient temperature, and at the maximum operating temperature (or hotter).



Self-Test With Position Data (Ambient)

| Parameter  | Units | Result   | Limit           |
|--|-------|----------|-----------------|
| EUT starts transmission after valid GPS data available | Y / N | Y        | Y               |
| Burst of 8 messages – AIS1/2 alternates                | Y / N | Y        | Y               |
| Burst of 8 messages – Sequence 1x14, 6x1, 1x14         | Y / N | Y        | Y               |
| User ID as configured                                  | Y / N | Y        | Y               |
| Nav Status   | -     | 15       | 15              |
| SOG Error  | kn    | 0        | <0.2            |
| Position accuracy flag                                 | 1 bit | 0        | RAIM result / 0 |
| Position Error   | m     | 0        | < 30            |
| COG  | -     | 0        | Not available   |
| Timestamp (UTC)  | s     | 37       | 0-59            |
| Communication state time-out                           | 1 bit | 0        | 0               |
| Communication state sub message                        | 1 bit | 0        | 0               |
| Transmission stops after one burst of 8 messages       | Y / N | Y        | Y               |
| Text message in Message 14                             | -     | MOB TEST | MOB TEST        |
| Correct indication as per manufacturer's documentation | Y / N | Y        | Y               |

Self-Test Without Position Data (Ambient):

| Parameter  | Units | Result | Limit |
|--|-------|--------|-------|
| EUT starts transmission within 5 mins                  | Y / N | N      | No TX |
| Burst of 8 messages – AIS1/2 alternates                | Y / N | N      | N     |
| Burst of 8 messages – Sequence 1x14, 6x1, 1x14         | Y / N | N      | N     |
| User ID as configured                                  | Y / N | N      | Y     |
| Nav Status   | -     | -      | -     |
| SOG Error  | kn    | -      | -     |
| Position accuracy                                      | 1 bit | -      | -     |
| Position   | m     | -      | -     |
| COG  | -     | -      | -     |
| Timestamp (UTC)  | s     | -      | -     |
| Communication state time-out                           | 1 bit | -      | -     |
| Communication state sub message                        | 1 bit | -      | -     |
| RAIM flag  | 1 bit | -      | -     |
| Transmission stops after one burst of 8 messages       | Y / N | -      | -     |
| Text message in Message 14                             | -     | -      | -     |
| Correct indication as per manufacturer's documentation | Y / N | -      | -     |

Self-Test With Position Data (-20°C)

| Parameter  | Units | Result   | Limit           |
|--|-------|----------|-----------------|
| EUT starts transmission after valid GPS data available | Y / N | Y        | Y               |
| Burst of 8 messages – AIS1/2 alternates                | Y / N | Y        | Y               |
| Burst of 8 messages – Sequence 1x14, 6x1, 1x14         | Y / N | Y        | Y               |
| User ID as configured                                  | Y / N | Y        | Y               |
| Nav Status   | -     | 15       | 15              |
| SOG Error  | kn    | 0        | < 0.2           |
| Position accuracy flag                                 | 1 bit | 0        | RAIM result / 0 |
| Position Error   | m     | 0        | < 30            |
| COG  | -     | -        | Not available   |
| Timestamp (UTC)  | s     | 35       | 0-59            |
| Communication state time-out                           | 1 bit | 0        | 0               |
| Communication state sub message                        | 1 bit | 0        | 0               |
| Transmission stops after one burst of 8 messages       | Y / N | Y        | Y               |
| Text message in Message 14                             | -     | MOB TEST | MOB TEST        |
| Correct indication as per manufacturer's documentation | Y / N | Y        | Y               |

Self-Test Without Position Data (-20°C)

| Parameter  | Units | Result | Limit |
|--|-------|--------|-------|
| EUT starts transmission within 5 mins                  | Y / N | N      | No TX |
| Burst of 8 messages – AIS1/2 alternates                | Y / N | N      | N     |
| Burst of 8 messages – Sequence 1x14, 6x1, 1x14         | Y / N | N      | N     |
| User ID as configured                                  | Y / N | N      | Y     |
| Nav Status   | -     | -      | -     |
| SOG Error  | kn    | -      | -     |
| Position accuracy                                      | 1 bit | -      | -     |
| Position   | m     | -      | -     |
| COG  | -     | -      | -     |
| Timestamp (UTC)  | s     | -      | -     |
| Communication state time-out                           | 1 bit | -      | -     |
| Communication state sub message                        | 1 bit | -      | -     |
| RAIM flag  | 1 bit | -      | -     |
| Transmission stops after one burst of 8 messages       | Y / N | -      | -     |
| Text message in Message 14                             | -     | -      | -     |
| Correct indication as per manufacturer's documentation | Y / N | -      | -     |

Self-Test With Position Data (+55°C)

| Parameter  | Units | Result   | Limit           |
|--|-------|----------|-----------------|
| EUT starts transmission after valid GPS data available | Y / N | Y        | Y               |
| Burst of 8 messages – AIS1/2 alternates                | Y / N | Y        | Y               |
| Burst of 8 messages – Sequence 1x14, 6x1, 1x14         | Y / N | Y        | Y               |
| User ID as configured                                  | Y / N | Y        | Y               |
| Nav Status   | -     | 15       | 15              |
| SOG Error  | kn    | 0        | < 0.2           |
| Position accuracy flag                                 | 1 bit | 0        | RAIM result / 0 |
| Position Error   | m     | 1.35     | < 3             |
| COG  | -     | 0        | Not available   |
| Timestamp (UTC)  | s     | 5 - 15   | 0-59            |
| Communication state time-out                           | 1 bit | 0        | 0               |
| Communication state sub message                        | 1 bit | 0        | 0               |
| Transmission stops after one burst of 8 messages       | Y / N | Y        | Y               |
| Text message in Message 14                             | -     | MOB TEST | MOB TEST        |
| Correct indication as per manufacturer's documentation | Y / N | Y        | Y               |



Self-Test Without Position Data (+55°C)

| Parameter  | Units | Result | Limit |
|--|-------|--------|-------|
| EUT starts transmission within 5 mins                  | Y / N | N      | No TX |
| Burst of 8 messages – AIS1/2 alternates                | Y / N | N      | N     |
| Burst of 8 messages – Sequence 1x14, 6x1, 1x14         | Y / N | N      | N     |
| User ID as configured                                  | Y / N | N      | Y     |
| Nav Status   | -     | -      | -     |
| SOG Error  | kn    | -      | -     |
| Position accuracy                                      | 1 bit | -      | -     |
| Position   | m     | -      | -     |
| COG  | -     | -      | -     |
| Timestamp (UTC)  | s     | -      | -     |
| Communication state time-out                           | 1 bit | -      | -     |
| Communication state sub message                        | 1 bit | -      | -     |
| RAIM flag  | 1 bit | -      | -     |
| Transmission stops after one burst of 8 messages       | Y / N | -      | -     |
| Text message in Message 14                             | -     | -      | -     |
| Correct indication as per manufacturer's documentation | Y / N | -      | -     |

Performance Check Results

| Parameter                          | Units | Result | Limit |
|------------------------------------|-------|--------|-------|
| Successful reception of Message 1  | Y / N | Y      | Y     |
| Successful reception of Message 14 | Y / N | Y      | Y     |

| Parameter                                     | Units | Result | Limit |
|---|-------|--------|-------|
| Successful reception of DSC Message 972001071 | Y / N | Y      | Y     |



Product Service

**2.18 INTERNAL NAVIGATION DEVICE SCENARIOS (ANNEX F)**

**2.18.1 Specification Reference**

RTCM 11901.1, Clause F.2.2

**2.18.2 Equipment Under Test and Modification State**

RescueME MOB1, MMSI 972001071 (TSR0001) and Mod State 0

**2.18.3 Date of Test**

17 December 2017

**2.18.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

**2.18.5 Environmental Conditions**

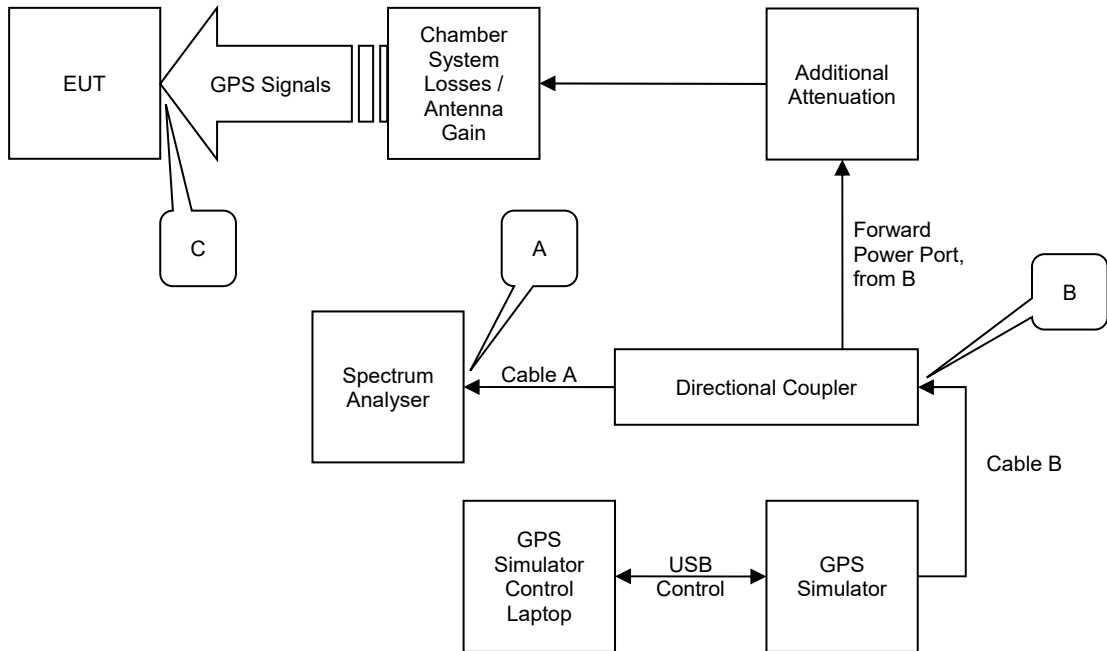
Ambient Temperature 22.7°C

Relative Humidity 35.1 %



2.18.6 Test Setup

Field Calibration



Field Calibration Schematic

The basic premise of the Field Calibration procedure is that Received Signal Strength ( $P_{RSS}$ ) at C equals  $P_{RSS}$  at B minus the loss from B to C (calibrated), where the  $P_{RSS}$  at B equals the power measured at A plus the loss B to A.

Resultant  $P_{RSS}$  at C is recorded for each scenario at the test results section, below.





## 2.18.7 Test Results

### Result Summary

#### Maritime Scenarios

General Note: The standard contains some contradictions, specifically regarding simulated positions (these contradictions are indicated in the table below with #). Testing was carried out in accordance with the Maritime Scenario Tables (D.6).

Scenario PRSS Summary Table:

| Scenario # | Number of SVs  | Required RSS [dBm] | Actual RSS [dBm] |
|------------|----------------|--------------------|------------------|
| 1          | 7              | -130.0             | -130.10          |
| 2          | 7              | -130.0             | -130.20          |
| 6          | 7              | -130.0             | -130.30          |
| 7          | 7              | -130.0             | -131.00          |
| 8          | 7              | -130.0             | -130.30          |
| 9          | 7              | -130.0             | -131.00          |
| 12         | 7 <sup>#</sup> | -130.0             | -130.35          |
| 13         | 7 <sup>#</sup> | -130.0             | -130.37          |
| 14         | 7 <sup>#</sup> | -130.0             | -130.61          |
| 16         | 7 <sup>#</sup> | -130.0             | -130.32          |
| 17         | 7 <sup>#</sup> | -130.0             | -130.42          |
| 18         | 7 <sup>#</sup> | -130.0             | -130.90          |
| 20         | 7              | -130.0             | -130.46          |
| 22         | 7              | -130.0             | -130.77          |
| 24         | 7              | -130.0             | -130.42          |
| 26         | 7              | -130.0             | -130.42          |
| 28         | 7              | -130.0             | -130.38          |
| 30         | 7              | -130.0             | -130.56          |
| 32         | 7              | -130.0             | -130.43          |
| 33         | 7              | -135.0             | -135.80          |
| 34         | 7              | -135.0             | -135.65          |
| 35         | 7              | -135.0             | -135.75          |
| 36         | 7              | -135.0             | -135.53          |
| 37         | 7              | -130.0             | -130.55          |
| 38         | 7              | -130.0             | -130.54          |
| 39         | 7              | -135.0             | -130.72          |



## Maritime Scenarios Test Results:

| Scenario # | TTF (min: sec) | Simulator Location   | Transmitted Location             | Location Error (m) |
|------------|----------------|----------------------|----------------------------------|--------------------|
| 1          | 01:45          | 0° 0' N, 0° 0' E     | 0° 0' 0.012" N 0° 0' 0.054" W    | 1.71               |
| 2          | 01:45          | 0° 0' N, 0° 0' E     | 0° 0' 0.0" N 0° 0' 0.012" W      | 0.37               |
| 6          | 01:44          | 80° 0' N, 0° 0' E*   | 79° 59' 59.94" N 0° 0' 0.162" E  | 1.93               |
| 7          | 01:46          | 0° 0' N, 0° 0' E     | 0° 0' 0.02" N 0° 0' 0.042" E     | 1.44               |
| 8          | 04:08          | 0° 0' N, 0° 0' E     | 0° 0' 0.006" S 0° 0' 0.03" W     | 0.95               |
| 9          | 04:44          | 0° 0' N, 0° 0' E     | 0° 0' 44.49" S 0° 2' 52.0" E     | 5498.67            |
| 12         | 04:44          | 80° 0' N, 0° 0' E    | 79° 59' 59.946" N 0° 0' 0.078" E | 1.69               |
| 13         | 02:50          | 80° 0' N, 0° 0' E    | 80° 0' 0.072" N 0° 0' 0.36" E    | 2.54               |
| 14         | 01:44          | 80° 0' N, 0° 0' E    | 79° 59' 59.976" N 0° 0' 0.018" E | 0.96               |
| 16         | 02:46          | 80° 0' N, 0° 0' E    | 79° 59' 59.998" N 0° 0' 0618 "E  | 2.11               |
| 17         | 02:49          | 80° 0' N, 0° 0' E    | 80° 0' 0.0" N 0° 0' 0.09" W      | 0.31               |
| 18         | 02:38          | 80° 0' N, 0° 0' E    | 80° 0' 0.012" N 0° 0' 0.378" E   | 1.34               |
| 20         | 01:44          | 0° 0' N, 0° 0' E     | 0° 0' 0.012" S 0° 0' 0.006" W    | 0.41               |
| 22         | 11:58          | 0° 0' N, 0° 0' E     | 0° 0' 0.18" N 0° 0' 0.048" W     | 5.75               |
| 24         | 01:44          | 0° 0' N, 0° 0' E     | 0° 0' 0.012" N 0° 0' 0.042" E    | 1.35               |
| 26         | 01:44          | 0° 0' N, 0° 0' E     | 0° 0' 0.024" N 0° 0' 0.06" E     | 2.00               |
| 28         | 01:44          | 0° 0' N, 0° 0' E     | 0° 0' 0.0" N 0° 0' 0.024" E      | 0.74               |
| 30         | 01:43          | 0° 0' N, 0° 0' E     | 0° 0' 0.06" N 0° 0' 0.0" E       | 1.85               |
| 32         | 01:42          | 0° 0' N, 0° 0' E     | 0° 0' 0.012" S 0° 0' 0.018" W    | 0.67               |
| 33         | 02:47          | 0° 0' N, 0° 0' E     | 0° 0' 0.096" S 0° 0' 0.096" W    | 4.19               |
| 34         | 02:49          | 0° 0' N, 0° 0' E     | 0° 0' 0.03" S 0° 0' 0.024" E     | 1.19               |
| 35         | 02:44          | 0° 0' N, 0° 0' E     | 0° 0' 0.024" S 0° 0' 0.03" W     | 1.19               |
| 36         | 03:46          | 0° 0' N, 0° 0' E     | 0° 0' 0.06" N 0° 0' 0.0" E       | 1.85               |
| 37         | 01:48          | 44° 3' S, 174° 9' E* | 44° 2' 59.99" S 174° 8' 59.97" E | 0.98               |
| 38         | 01:48          | 47° 21' N, 8° 27' W* | 47° 20' 59.97" N 8° 27' 0.0" W   | 0.93               |
| 39         | 02:48          | 0° 0' N, 0° 0' E     | 0° 0' 0.702" S 0° 0' 0.642" W    | 29.37              |

Note: \* refer Table D1 to D6, Table D6 used.



## Maritime Scenarios Results Analysis (D.4):

| Criteria                               | Limit / Condition   | Result |
|--|---|--------|
| No. of Successful Tests                | TTFF ≤ 5 minutes  | 25     |
| Total No. of Maritime Scenarios        | 26  | N/A    |
| TTFF Percentage Success Rate           | $(\text{No. Successful Tests} / 26) \times 100$   | 96.2   |
| TTFF Pass / Fail Limit                 | ≥ 70%   | N/A    |
| No of Locations with Errors            | ≤ 30 m  | 25     |
| No of Scenarios with Locations         | Enter result  | 25     |
| Location Accuracy Percentage Pass Rate | $(\text{No Locations Errors} \leq 30 \text{ m} / \text{No Scenarios with Location}) \times 100$ | 96.2   |
| Location Accuracy Pass / Fail Limit    | ≥ 70%   | N/A    |

|   | Pass / Fail |
|---|-------------|
| Maritime TTFF Success Rate ≥ 70%  | Pass        |
| Maritime Location Accuracy Pass Rate ≥ 70%  | Pass        |
| Both results must be a "Pass" for the AU to pass, any one or more "Fails" indicated failure |             |



## **2.19 BATTERY CAPACITY TEST**

### **2.19.1 Specification Reference**

RTCM 11901.1, Clause E.6.5

### **2.19.2 Equipment Under Test and Modification State**

RescueME MOB1, MMSI 972606044 (TSR0007) and Mod State 1

### **2.19.3 Date of Test**

15 May 2018 to 16 May 2018

### **2.19.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

### **2.19.5 Environmental Conditions**

Ambient Temperature 20.7°C  
Relative Humidity 34.1 %  
Chamber -20°C

### **2.19.6 Test Method**

As permitted by the standard, the Manufacturer provided a battery pack which was previously discharged in accordance with the clause 5.2 (see also Annex A for Manufacturers data).

The Standard requires that the AU shall be placed in a chamber at normal room temperature. Then the temperature shall be reduced to and maintained at  $-20\text{ °C} \pm 3\text{ °C}$  for a period of 10 – 16 hours.

After this time EUT shall be activated in its mode of maximum current draw (declared by the Manufacturer as GPS search) 30 min after the end of the period and shall then be kept working continuously for a period of 12 hours. The temperature of the chamber shall be maintained as specified above for the whole of the period of 12 hours.

The operation of the AU during the test shall be verified. In addition, at the end of the 12-hour period, a performance test shall be performed.



### 2.19.7 Test Results

The EUT continued to operate at -20°C for a period of 24 hours. The AIS messages were confirmed via a Class A AIS throughout the 24 hours.

The DSC message reception was confirmed periodically via the Sailor RT5022 VHF with DSC radio.

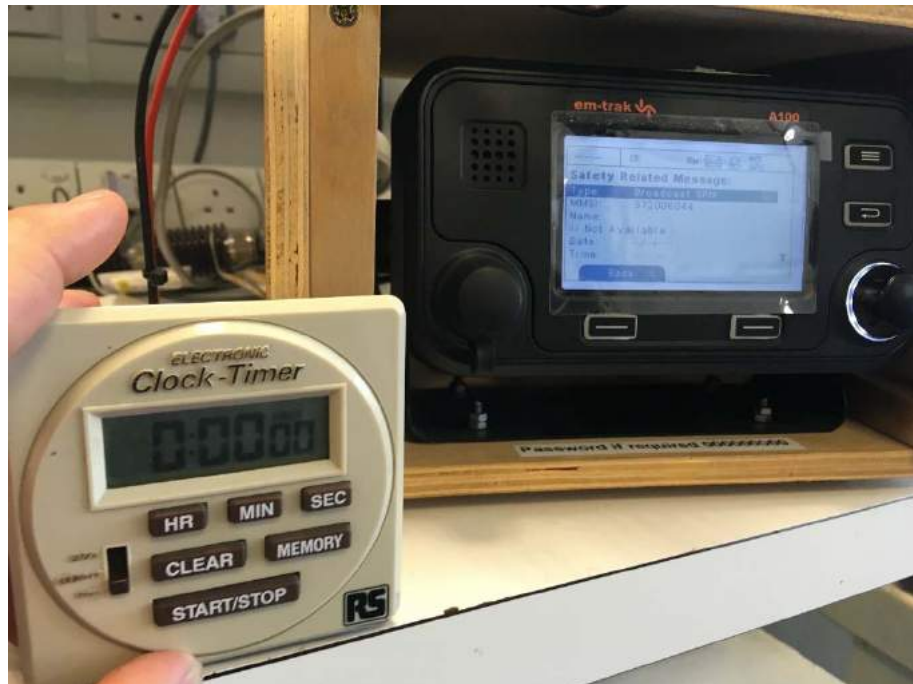


EUT – Battery Capacity Test



Battery Capacity Test Monitoring Equipment





End of 24-hour duration (AIS message received)



End of 24-hour duration (DSC message received)

After the 24-hour period the AU was brought back to ambient, tested and found to be operational.



Product Service

### **SECTION 3**

#### **TEST EQUIPMENT USED**





### 3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

| <b>Section 2.2 Climatic – Dry Heat</b>                              |                         |                         |      |    |             |
|---|-------------------------|-------------------------|------|----|-------------|
| Montford F43  | Montford                | 4FT CUBED               | 2126 | 12 | 24-Jan-2018 |
| <b>Section 2.3 Climatic – Damp Heat</b>                             |                         |                         |      |    |             |
| Montford F43  | Montford                | 4FT CUBED               | 2126 | 12 | 24-Jan-2018 |
| <b>Section 2.5 Climatic - Thermal Shock</b>                         |                         |                         |      |    |             |
| Montford F43  | Montford                | 4FT CUBED               | 2126 | 12 | 12-Jan-2019 |
| Temperature Logger  | Digitron                | 2098T                   | 2479 | 12 | 6-Dec-2018  |
| Bench Scales  | Kern-Sohn               | CKE16K0.05              | 4647 | 12 | 14-Mar-2018 |
| Climatic Chamber  | Aralab                  | Aralab 1, 1000<br>ECP75 | 4718 | 12 | 12-Jun-2018 |
| Type T PFA Insulated Thermocouple                                   | TC Limited              | Type-T                  | 4739 | 12 | 20-Jul-2018 |
| <b>Section 2.6 ENV – Drop onto Hard Surface</b>                     |                         |                         |      |    |             |
| Lansmont  | Lansmont                | PDT 56E                 | 2291 | -  | TU          |
| Hardwood Block  | Unknown                 | ELM                     | 2650 | -  | TU          |
| 10-meter Tape Measure   | Stanley                 | Fatmax 10m/33'          | 4073 | -  | TU          |
| <b>Section 2.8 Vibration</b>  |                         |                         |      |    |             |
| Charge Amplifier  | Endevco                 | 133                     | 2503 | 12 | 21-Apr-2018 |
| LDS 984   | Ling                    | 984LS/DPAK130           | 2513 | 6  | 7-Aug-2018  |
| Accelerometer   | Endevco                 | 256-10                  | 3440 | 6  | 6-Mar-2018  |
| Vibration Controller  | m + p International     | Vibpilot 8              | 3772 | 12 | 7-Sep-2018  |
| Isotron Accelerometer   | Endevco                 | 256-10                  | 3785 | 6  | 6-Mar-2018  |
| Isotron Accelerometer   | Endevco                 | 256-10                  | 3789 | 6  | 7-Mar-2018  |
| <b>Section 2.9 and 2.10 Climatic – Rain and Spray and Immersion</b> |                         |                         |      |    |             |
| Hygrometer  | Rotronic                | A1                      | 1388 | 12 | 4-May-2018  |
| Montford F43  | Montford                | 4FT CUBED               | 2126 | 12 | 12-Jan-2019 |
| Balance   | Geniweigher             | GM-11K                  | 2334 | 12 | 14-Mar-2018 |
| Thermometer   | Digitron                | T208                    | 2340 | 12 | 21-Nov-2018 |
| Water Spray Head  | Pipework & Eng Serv     |                         | 2452 | 24 | 3-Nov-2018  |
| 940 litre Tank  | Unknown                 | 940 litre               | 3574 | -  | TU          |
| Stop Watch  | Radio Spares            | Model 694 (974)         | 4025 | 0  | 27-Oct-2018 |
| Stop Watch  | Radio Spares            | Model 694 (974)         | 4026 | 0  | 27-Oct-2018 |
| 12.5 Litre Container  | TUV SUD Product Service | n/a                     | 4027 | -  | TU          |
| Bench Scales  | Kern-Sohn               | CKE16K0.05              | 4647 | 12 | 14-Mar-2018 |
| Type T PFA Insulated Thermocouple                                   | TC Limited              | Type-T                  | 4739 | 12 | 20-Jul-2018 |
| Tape Measure 8m   | Stanley                 | FatMax                  | 4878 | -  | TU          |
| <b>Section 2.14 – EMC – Compass Safe Distance</b>                   |                         |                         |      |    |             |
| Magnetometer  | Bartington              | MAG01                   | 671  | 36 | 24-Mar-2018 |
| Compass Verification Unit   | TUV SUD Product Service | CVU                     | 3579 |    | TU          |
| Marine Binnacle Compass with Repeater Display                       | Cassens & Plath         | Compass: Type 11        | 3834 | -  | TU          |
| <b>Section 2.18 Beacons - GNSS - RTCM Scenarios</b>                 |                         |                         |      |    |             |
| Antenna (Double Ridge Guide)  | EMCO                    | 3115                    | 34   | 12 | 8-Dec-2018  |
| Directional Coupler   | Narda                   | 3022                    | 503  | -  | O/P Mon     |
| Termination (50ohm)   | Diamond Antenna         | DL-30N                  | 544  | 12 | 14-Feb-2018 |
| Spectrum Analyser   | Agilent Technologies    | E7405A                  | 1410 | 12 | 23-Aug-2018 |
| Programmable Power Supply   | Iso-tech                | IPS 2010                | 2437 | -  | O/P Mon     |



| <b>Section 2.18 Beacons - GNSS - RTCM Scenarios</b>           |                      |           |      |    |             |
|---|----------------------|-----------|------|----|-------------|
| Attenuator (10dB, 50W)  | Aeroflex / Weinschel | 47-10-34  | 3166 | 12 | 20-Oct-2018 |
| Network Analyser  | Rohde & Schwarz      | ZVA 40    | 3548 | 12 | 2-Oct-2018  |
| Multi-GNSS Simulator (GPS)                                    | Spirent              | GSS6700   | 4596 | 12 | 11-Aug-2018 |
| <b>Section 2.19 Battery Capacity Test</b>                     |                      |           |      |    |             |
| 3 dB attenuator   | Narda                | 766F-3    | 3962 | 12 | 01-Nov-18   |
| 10 dB attenuator  | Trilithic            | HFP-50N   | 1377 | 12 | 20-Dec-18   |
| 10 dB attenuator  | Texcan               | HFP-50N   | 468  | 12 | 28-Jun-18   |
| 10 dB attenuator  | Narda                | 766-10    | 480  | 12 | 18-Dec-18   |
| RS TEMP Meter   | RS Components        | 615-8206  | 3612 | 12 | 12-Sep-18   |
| CHAMBER VMT 04/30   | Heraeus Votsch       | VMT 04/30 | 40   | -  | O/P MON     |
| <b>Section 2.16 Controls and Indicators (Sharp edge test)</b> |                      |           |      |    |             |
| Sharp edge tester   | TES TEC GmbH         | SET-50    | 2792 | -  | TU          |

TU – Traceability Unscheduled

O/P MON – Output Monitored with Calibrated Equipment



### 3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are: -

| Test Discipline                           | MU                      |
|---|-------------------------|
| Battery Capacity and Low Temperature Test | See Power and Frequency |
| Compass accuracy                          | $\pm 0.1^\circ$         |



Product Service

## **SECTION 4**

### **PHOTOGRAPHS**



4.1 PHOTOGRAPHS OF EQUIPMENT UNDER TEST (EUT)



Front View



Side View



Product Service



Antenna Deployed View



Product Service

## **SECTION 5**

### **ACCREDITATION, DISCLAIMERS AND COPYRIGHT**



Product Service

## 5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).

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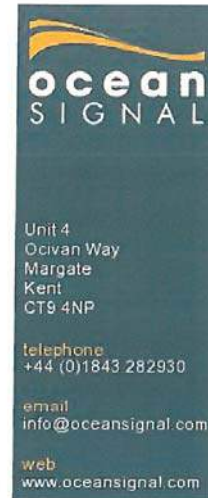
## **ANNEX A**

### **MANUFACTURER SUPPLIED INFORMATION**



Product Service

## Manufacturer Materials Waiver and Declarations

23<sup>rd</sup> February 2018

### **Subject RescueME MOB1 Material waiver and Disclosure Information, including Waiver Statement for Label Legibility and Comprehensibility Tests**

To Whom It May Concern:

Ocean Signal Limited hereby declares that the labelling on the RescueME product fully complies with the requirements of RTCM 11901.1 Section 5.3.2.

IEC 60945 stipulates that where a manufacture can produce evidence that the components, materials and finishes employed in the equipment would satisfy the following tests then the tests shall be waived:

- Corrosion (Salt Mist) IEC 60945 (8.12) & RTCM 11901.1 (8.1.2)
- Solar Radiation IEC 60945 (8.10) & RTCM 11901.1 (8.1.2)
- Oil resistance IEC 60945 (8.11) & RTCM 11901.1 (8.1.2)

In this instance Ocean Signal Limited claim, for one or more of the reasons listed below that these criteria are met and therefore make application that the tests be waived.

- 1 The materials have a proven history of service in a marine environment, either from use in Ocean Signal's existing approved product range, or by implication from a long established history of exposure without effect e.g. Stainless steel).
- 2 The material manufacturer has conducted equivalent testing and has declared the product as being immune to these effects in the relevant data sheet.
- 3 Ocean Signal Limited, in house testing has proven the materials to be immune to the cause of degradation (e.g. oil resistance)
- 4 Ocean Signal Limited has previously had the materials tested on other approved products which demonstrated the materials conformance to the test requirements.

Registration No  
6627101

Vat No  
938 4374 89

Registered Office  
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Building 6000,  
Langstone  
Technology Park,  
Langstone Road,  
Havant, PO9 1SA



Product Service

Ocean Signal Limited hereby declares that the materials used in the construction of the RescueME MOB1 as here-in listed are not affected by the degrading agents listed above.

Signed on behalf of Ocean Signal Limited.

Simon Nolan  
Chief technical Officer

The following is a list of components and materials used in the RescueMe MOB1 that are in direct contact with the marine environment.

|                   |                     |
|-------------------|---------------------|
| Case Bottom       | Xenoy               |
| Case Top          | Xenoy               |
| Sealing Gasket    | Silicone Rubber     |
| Antenna Cover     | Xenoy               |
| Antenna Blade     | Stainless Steel 301 |
| Antenna Contact   | Stainless Steel 304 |
| Antenna Overmould | Polypropylene       |
| Screw             | Stainless Steel A2  |
| Arming Slider     | Acetal              |
| Antenna retainer  | Acetal              |
| Mounting bracket  | Xenoy               |
| LED Lens          | PMMA                |
| Labels            | Polycarbonate       |
| Antenna cover     | Polycarbonate       |
| Lanyard           | Polyester Cord      |



Product Service

Report 122014/1 Issue 1 Page 1 of 4



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Tel: +44 (0)1737 372670 Fax: +44 (0)1737 772795 Email: [info@sartech.com](mailto:info@sartech.com) Website: [www.sartech.com](http://www.sartech.com)

## Report On

UN Transportation Safety Tests on  
lithium primary batteries  
Ocean Signal 901S-01509

COMMERCIAL IN CONFIDENCE

Issue 1 16 December 2014

A handwritten signature in black ink, appearing to read 'Peter Forey'.

Peter Forey  
Director



Registered in England No. 3328421





Product Service

Report 122014/1 Issue 1 Page 2 of 4

## 1 Summary and Conclusions

This report details tests carried out in accordance with Section 38.3 of UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria, fifth revised edition (ST/SG/AC.10/11/Rev.5)

Batteries tested were as follows:

| Battery type | Description                                     | Reference numbers of samples tested            |
|--------------|---|--|
| 9015-01509   | Primary battery using 2 x Energizer CR123 cells | 1,2,3,4 (Undischarged)<br>5,6,7,8 (Discharged) |

All battery samples were found to meet the test requirements as defined in the standard.



Registered in England No. 3328421



Product Service

Report 122014/1 Issue 1 Page 3 of 4

## 2 Index

1. Summary and conclusions
2. Index
3. Test programme

### Appendices

1. Test sheets - T.1
2. Test sheets - T.2
3. Test sheets - T.3
4. Test sheets - T.4
5. Test sheets - T.5 (Undischarged)
6. Test sheets - T.5 (Discharged)



Registered in England No. 3328421





### 3 Test programme

All battery samples were subjected to tests T.1 to T.5 in sequence. Test equipment calibration certificates and detailed logs for vibration and test runs are available on request.

#### 3.1 Test T.1: Altitude test

Appendix 1 shows the data recorded before and after the test. No abnormal comments were recorded.

#### 3.2 Test T.2: Thermal test

Appendix 2 shows the data recorded before and after the test. No abnormal comments were recorded.

#### 3.3 Test T.3: Vibration test

Appendix 3 shows the data recorded before and after the test. No abnormal comments were recorded.

#### 3.4 Test T.4: Shock test

Appendix 4 shows the data recorded before and after the test. No abnormal comments were recorded.

#### 3.5 Test T.5: Short circuit test

Appendix 5 shows the data recorded during the test. No abnormal comments were recorded.



Registered in England No. 3328421





Product Service

# SARTECH

UN- ST/SG/AC.10/11/Rev.5      CUSTOMER: OCEAN SIGNAL

## SECTION: 38.3.4.1 TEST 1 - ALTITUDE TEST RESULT SHEET

BATTERY TYPE: 2 CELL PACK      OS REF: 901S-01509

CELLS: 2 x ENERGIZER LITHIUM 123

### FULLY UNDISCHARGED – TEST PRESSURE <11.6kPa for 6hrs

| SARTECH BATTERY REFERENCE:  | 1         | 2         | 3         | 4         |
|-----------------------------|-----------|-----------|-----------|-----------|
| Initial voltage             | 6.484     | 6.487     | 6.488     | 6.3483    |
| Initial mass (g)            | 34.1779   | 34.1222   | 34.0277   | 33.932    |
| TEST PRESSURE (max kPa abs) | 11.0      | 11.0      | 11.0      | 11.0      |
| Voltage after test          | 6.484     | 6.488     | 6.488     | 6.22      |
| Mass after test (g)         | 34.1778   | 34.122    | 34.0276   | 33.9322   |
| OBSERVATIONS                | PASS/FAIL | PASS/FAIL | PASS/FAIL | PASS/FAIL |
| Leakage                     | PASS      | PASS      | PASS      | PASS      |
| Venting                     | PASS      | PASS      | PASS      | PASS      |
| Disassembly                 | PASS      | PASS      | PASS      | PASS      |
| Rupture                     | PASS      | PASS      | PASS      | PASS      |
| Fire                        | PASS      | PASS      | PASS      | PASS      |

### FULLY DISCHARGED – TEST PRESSURE <11.6kPa for 6hrs

| SARTECH BATTERY REFERENCE:  | 1         | 2         | 3         | 4         |
|-----------------------------|-----------|-----------|-----------|-----------|
| Initial mass (g)            | 33.9815   | 33.8401   | 34.0325   | 33.905    |
| TEST PRESSURE (max kPa abs) | 11.0      | 11.0      | 11.0      | 11.0      |
| Mass after test (g)         | 33.9814   | 33.8403   | 34.0324   | 33.9046   |
| OBSERVATIONS                | PASS/FAIL | PASS/FAIL | PASS/FAIL | PASS/FAIL |
| Leakage                     | PASS      | PASS      | PASS      | PASS      |
| Venting                     | PASS      | PASS      | PASS      | PASS      |
| Disassembly                 | PASS      | PASS      | PASS      | PASS      |
| Rupture                     | PASS      | PASS      | PASS      | PASS      |
| Fire                        | PASS      | PASS      | PASS      | PASS      |

| TEST EQUIPMENT                    | SERIAL NUMBER |
|-----------------------------------|---------------|
| Island Scientific chamber 230x230 | 1101050       |
| Keller LEO2 pressure gauge        | 49794         |
| Thurlby Thandar DMM 1705          | 103851        |
| Adam balance                      | AE437781      |

TEMPERATURE 20C +-5C: YES

COMMENTS:  
All results within specification

# SARTECH

SARTECH ENGINEERING LTD.  
13 Trowers Way  
Holmethorpe Industrial Estate,  
Redhill, Surrey RH1 2LH, U.K.  
Tel: 01737 273470 Fax: 01737 770171

START DATE: 17/10/14 TIME: 08:30 FINISH DATE: 17/10/14 TIME: 15:00

ENGINEER: .....  
*T. S. Compton*

DATE: 26/11/14





Product Service



UN- ST/SG/AC.10/11/Rev.5 CUSTOMER: OCEAN SIGNAL

SECTION: 38.3.4.2 TEST 2 – THERMAL TEST RESULT SHEET

BATTERY TYPE: 2 CELL PACK OS REF: 901S-01509

CELLS: 2 x ENERGIZER LITHIUM 123

FULLY UNDISCHARGED – TEST TEMPERATURE -40C TO +75C 10 CYCLES  
STORAGE FOR 24 HOURS AT 20C +- 5C

| SARTECH BATTERY REFERENCE: | 1         | 2         | 3         | 4         |
|----------------------------|-----------|-----------|-----------|-----------|
| Initial voltage            | 6.484     | 6.488     | 6.488     | 6.22      |
| Initial mass (g)           | 34.1778   | 34.122    | 34.0276   | 33.9322   |
| Voltage after test         | 6.529     | 6.53      | 6.53      | 6.516     |
| Mass after test (g)        | 34.1709   | 34.1137   | 34.0145   | 33.9253   |
| OBSERVATIONS               | PASS/FAIL | PASS/FAIL | PASS/FAIL | PASS/FAIL |
| Leakage                    | PASS      | PASS      | PASS      | PASS      |
| Venting                    | PASS      | PASS      | PASS      | PASS      |
| Disassembly                | PASS      | PASS      | PASS      | PASS      |
| Rupture                    | PASS      | PASS      | PASS      | PASS      |
| Fire                       | PASS      | PASS      | PASS      | PASS      |

FULLY DISCHARGED – TEST TEMPERATURE -40C TO +75C 10 CYCLES  
STORAGE FOR 24 HOURS AT 20C +- 5C

| SARTECH BATTERY REFERENCE: | 1         | 2         | 3         | 4         |
|----------------------------|-----------|-----------|-----------|-----------|
| Initial mass (g)           | 33.9814   | 33.8403   | 34.0324   | 33.9046   |
| Mass after test (g)        | 33.9725   | 33.8305   | 34.025    | 33.8906   |
| OBSERVATIONS               | PASS/FAIL | PASS/FAIL | PASS/FAIL | PASS/FAIL |
| Leakage                    | PASS      | PASS      | PASS      | PASS      |
| Venting                    | PASS      | PASS      | PASS      | PASS      |
| Disassembly                | PASS      | PASS      | PASS      | PASS      |
| Rupture                    | PASS      | PASS      | PASS      | PASS      |
| Fire                       | PASS      | PASS      | PASS      | PASS      |

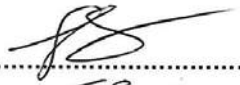
| TEST EQUIPMENT                  | SERIAL NUMBER |
|---------------------------------|---------------|
| Medical Supplies Assoc. Chamber | 71/147        |
| West 6400 Controller            | unknown       |
| Thurlby Thandar DMM 1705        | 103851        |
| Adam balance                    | AE437781      |



SARTECH ENGINEERING LTD.  
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COMMENTS:  
All results within specification

START DATE: 17/10/14 TIME: 15:00 FINISH DATE: 27/10/14 TIME: 0800

ENGINEER:   
T.S. Compton

DATE: 26/11/14



Product Service

# SARTECH

UN- ST/SG/AC.10/11/Rev.5 CUSTOMER: OCEAN SIGNAL

SECTION: 38.3.4.3 TEST 3 - VIBRATION - TEST RESULT SHEET

BATTERY TYPE: 2 CELL PACK OS REF: 901S-01509

CELLS: 2 x ENERGIZER LITHIUM 123

**FULLY UNDISCHARGED – TEST 7Hz - 200Hz 12 CYCLES OVER 3 HOURS**

| SARTECH BATTERY REFERENCE: | 1                | 2                | 3                | 4                |
|----------------------------|------------------|------------------|------------------|------------------|
| Initial voltage            | 6.529            | 6.53             | 6.53             | 6.516            |
| Initial mass (g)           | 34.1709          | 34.1137          | 34.0145          | 33.9253          |
| Voltage after test         | 6.527            | 6.527            | 6.527            | 6.514            |
| Mass after test (g)        | 34.1716          | 34.1157          | 34.015           | 33.9259          |
| <b>OBSERVATIONS</b>        | <b>PASS/FAIL</b> | <b>PASS/FAIL</b> | <b>PASS/FAIL</b> | <b>PASS/FAIL</b> |
| Leakage                    | PASS             | PASS             | PASS             | PASS             |
| Venting                    | PASS             | PASS             | PASS             | PASS             |
| Disassembly                | PASS             | PASS             | PASS             | PASS             |
| Rupture                    | PASS             | PASS             | PASS             | PASS             |
| Fire                       | PASS             | PASS             | PASS             | PASS             |
|                            | PASS             | PASS             | PASS             | PASS             |

**FULLY DISCHARGED – TEST 7Hz - 200Hz 12 CYCLES OVER 3 HOURS**

| SARTECH BATTERY REFERENCE: | 1                | 2                | 3                | 4                |
|----------------------------|------------------|------------------|------------------|------------------|
| Initial mass (g)           | 33.9725          | 33.8305          | 34.025           | 33.8906          |
| Mass after test (g)        | 33.9727          | 33.8317          | 34.027           | 33.8993          |
| <b>OBSERVATIONS</b>        | <b>PASS/FAIL</b> | <b>PASS/FAIL</b> | <b>PASS/FAIL</b> | <b>PASS/FAIL</b> |
| Leakage                    | PASS             | PASS             | PASS             | PASS             |
| Venting                    | PASS             | PASS             | PASS             | PASS             |
| Disassembly                | PASS             | PASS             | PASS             | PASS             |
| Rupture                    | PASS             | PASS             | PASS             | PASS             |
| Fire                       | PASS             | PASS             | PASS             | PASS             |

| TEST EQUIPMENT             | SERIAL NUMBER |
|----------------------------|---------------|
| LDS Dactron SPAK Amplifier | 96660/1       |
| LDS Dactron Comet USB      | 12107947      |
| PCB Transducer 353B34      | 108267        |
| Thurlby Thandar DMM 1705   | 103851        |
| Adam Balance               | AE437781      |

**COMMENTS:**  
All results within specification

**SARTECH**  
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START DATE: 27/10/14 TIME: 08:00 FINISH DATE: 31/10/14 TIME: 16:30

ENGINEER: .....  
*T.S. Compton*

DATE: 26/11/14



Product Service

# SARTECH

UN- ST/SG/AC.10/11/Rev.5      CUSTOMER: OCEAN SIGNAL

SECTION: 38.3.4.3      TEST 4 SHOCK - TEST RESULT SHEET

BATTERY TYPE: 2 CELL PACK      OS REF: 901S-01509

CELLS: 2 x ENERGIZER LITHIUM 123

**FULLY UNDISCHARGED – HALF SINE 6ms 150g**

| SARTECH BATTERY REFERENCE: | 1                | 2                | 3                | 4                |
|----------------------------|------------------|------------------|------------------|------------------|
| Initial voltage            | 6.024            | 6.53             | 6.53             | 6.53             |
| Initial mass (g)           | 34.1713          | 34.1159          | 34.0135          | 33.9257          |
| Voltage after test         | 6.149            | 6.53             | 6.531            | 6.516            |
| Mass after test (g)        | 34.1753          | 34.1176          | 34.0188          | 33.9291          |
| <b>OBSERVATIONS</b>        | <b>PASS/FAIL</b> | <b>PASS/FAIL</b> | <b>PASS/FAIL</b> | <b>PASS/FAIL</b> |
| Leakage                    | PASS             | PASS             | PASS             | PASS             |
| Venting                    | PASS             | PASS             | PASS             | PASS             |
| Disassembly                | PASS             | PASS             | PASS             | PASS             |
| Rupture                    | PASS             | PASS             | PASS             | PASS             |
| Fire                       | PASS             | PASS             | PASS             | PASS             |
|                            | PASS             | PASS             | PASS             | PASS             |

**FULLY DISCHARGED – HALF SINE 6ms 150g**

| SARTECH BATTERY REFERENCE: | 1                | 2                | 3                | 4                |
|----------------------------|------------------|------------------|------------------|------------------|
| Initial mass (g)           | 33.973           | 33.8322          | 34.0269          | 33.8999          |
| Mass after test (g)        | 33.9762          | 33.835           | 34.0306          | 33.9029          |
| <b>OBSERVATIONS</b>        | <b>PASS/FAIL</b> | <b>PASS/FAIL</b> | <b>PASS/FAIL</b> | <b>PASS/FAIL</b> |
| Leakage                    | PASS             | PASS             | PASS             | PASS             |
| Venting                    | PASS             | PASS             | PASS             | PASS             |
| Disassembly                | PASS             | PASS             | PASS             | PASS             |
| Rupture                    | PASS             | PASS             | PASS             | PASS             |
| Fire                       | PASS             | PASS             | PASS             | PASS             |

| TEST EQUIPMENT             | SERIAL NUMBER |
|----------------------------|---------------|
| LDS Dactron SPAK Amplifier | 96660/1       |
| LDS Dactron Comet USB      | 12107947      |
| PCB Transducer 353B03      | 108361        |
| Thurlby Thandar DMM 1705   | 103851        |
| Adam balance               | AE437781      |

START DATE: 7/11/14 TIME: 0800 FINISH DATE: 7/11/14 TIME: 16:30

**COMMENTS:**  
All results within specification

ENGINEER: .....

T. S. Cooper

DATE: 26/11/14



SARTECH ENGINEERING LTD.  
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Tel: 01737 979470 Fax: 01737 772701



Product Service

# SARTECH

UN- ST/SG/AC.10/11/Rev.5

CUSTOMER: OCEAN SIGNAL

SECTION: 38.3.4.5

TEST 5 – SHORT CIRCUIT TEST RESULT SHEET

BATTERY TYPE: 2 CELL PACK

OS REF: 901S-01509

CELLS: 2 X ENERGISER LITHIUM 123

FULLY UNDISCHARGED – < 0.10HM SHORT @ +55C

| BATTERY REF.            | 1         | 2         | 2         | 2         |              |
|-------------------------|-----------|-----------|-----------|-----------|--------------|
| TEMP CHECK              | TEMP.     | TEMP.     | TEMP.     | TEMP.     | TIME OR DATE |
| START TIME @ 55C        | 08:00     | 08:00     | 08:00     | 08:00     | 25/11/14     |
| 2 hr STABILIZE          | 55        | 54        | 55        | 55        | 10:00        |
| TEMP CHECK 1            | 57        | 56        | 58        | 68        | 10:05        |
| TEMP CHECK 2            | 61        | 67        | 74        | 90        | 10:10        |
| TEMP CHECK 3            | 64        | 66        | 74        | 87        | 10:15        |
| TEMP CHECK 4            | 63        | 63        | 78        | 78        | 10:30        |
| TEMP CHECK 5            | 65        | 61        | 75        | 71        | 10:50        |
| TEMP CHECK 6            | 67        | 62        | 73        | 78        | 11:15        |
| TEMP CHECK 7            | 70        | 65        | 76        | 80        | 12:15        |
| TEMP CHECK 8            | 72        | 67        | 78        | 78        | 13:15        |
| TEMP CHECK 9            | 66        | 85        | 76        | 82        | 14:15        |
| TEMP CHECK 10           | 62        | 62        | 71        | 60        | 15:15        |
| TEMP CHECK 11           | 65        | 60        | 60        | 57        | 16:15        |
| NOT MONITORED OVERNIGHT |           |           |           |           | 26/11/14     |
| TEMP CHECK 12           | 56        | 56        | 55        | 55        | 07:30        |
| OBSERVED UNTIL          |           |           |           |           | 13:30        |
|                         |           |           |           |           |              |
| OBSERVATION             | PASS/FAIL | PASS/FAIL | PASS/FAIL | PASS/FAIL |              |
| Temp. =< 170C           | PASS      | PASS      | PASS      | PASS      |              |
| Disassembly             | PASS      | PASS      | PASS      | PASS      |              |
| Rupture                 | PASS      | PASS      | PASS      | PASS      |              |
| Fire                    | PASS      | PASS      | PASS      | PASS      |              |

6 HOUR OBSERVATION COMPLETED: .....

| TEST EQUIPMENT                  | SERIAL NUMBER |
|---------------------------------|---------------|
| Medical Supplies Assoc. chamber | 71/147        |
| West 6400 Controller            | Unknown       |
| Fluke Foodpro                   | 07070084      |

START DATE: 25/11/14 TIME: 08:00 FINISH DATE: 26/11/14 TIME: 13:30

**COMMENTS:**

All results within specification

## SARTECH

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 13 Trowers Way  
 Holmethorpe Industrial Estate,  
 Redhill, Surrey RH1 2LH, U.K.  
 Tel: 01737 222670 Fax: 01737 772777

ENGINEER: .....

T.S. Cooper

DATE: 26/11/14



Product Service

# SARTECH

UN- ST/SG/AC.10/11/Rev.5

CUSTOMER: OCEAN SIGNAL

SECTION: 38.3.4.5

TEST 5 – SHORT CIRCUIT TEST RESULT SHEET

BATTERY TYPE: 2 CELL PACK

OS REF: 901S-01509

CELLS: 2 X ENERGISER LITHIUM 123

FULLY DISCHARGED – < 0.1OHM SHORT @ +55C

| BATTERY REF.            | 1         | 2         | 2         | 2         |              |
|-------------------------|-----------|-----------|-----------|-----------|--------------|
| TEMP CHECK              | TEMP.     | TEMP.     | TEMP.     | TEMP.     | TIME OR DATE |
| START TIME @ 55C        | 08:00     | 08:00     | 08:00     | 08:00     | 25/11/14     |
| 2 hr STABILIZE          | 54        | 55        | 54        | 54        | 10:00        |
| TEMP CHECK 1            | 55        | 56        | 56        | 57        | 10:05        |
| TEMP CHECK 2            | 58        | 59        | 60        | 60        | 10:10        |
| TEMP CHECK 3            | 58        | 59        | 60        | 59        | 10:15        |
| TEMP CHECK 4            | 59        | 60        | 59        | 59        | 10:30        |
| TEMP CHECK 5            | 58        | 58        | 58        | 58        | 10:50        |
| TEMP CHECK 6            | 58        | 57        | 58        | 58        | 11:15        |
| TEMP CHECK 7            | 56        | 56        | 57        | 56        | 12:15        |
| TEMP CHECK 8            | 56        | 56        | 57        | 56        | 13:15        |
| TEMP CHECK 9            | 56        | 57        | 56        | 56        | 14:15        |
| TEMP CHECK 10           | 55        | 56        | 55        | 56        | 15:15        |
| TEMP CHECK 11           | 56        | 56        | 56        | 55        | 16:15        |
| NOT MONITORED OVERNIGHT |           |           |           |           | 26/11/14     |
| TEMP CHECK 12           | 55        | 55        | 55        | 55        | 07:30        |
| OBSERVED UNTIL          |           |           |           |           | 13:30        |
| OBSERVATION             | PASS/FAIL | PASS/FAIL | PASS/FAIL | PASS/FAIL |              |
| Temp. =< 170C           | PASS      | PASS      | PASS      | PASS      |              |
| Disassembly             | PASS      | PASS      | PASS      | PASS      |              |
| Rupture                 | PASS      | PASS      | PASS      | PASS      |              |
| Fire                    | PASS      | PASS      | PASS      | PASS      |              |

6 HOUR OBSERVATION COMPLETED: .....

| TEST EQUIPMENT                  | SERIAL NUMBER |
|---------------------------------|---------------|
| Medical Supplies Assoc. chamber | 71/147        |
| West 6400 Controller            | Unknown       |
| Fluke Foodpro                   | 07070084      |

START DATE: 25/11/14 TIME: 08:00 FINISH DATE: 26/11/14 TIME: 13:30

**COMMENTS:**

All results within specification

## SARTECH

SARTECH ENGINEERING LTD.

13 Trowers Way

Holmethorpe Industrial Estate,

Redhill, Surrey RH1 2LH. U.K.

Tel: 01737 979470 Fax: 01737 77277

ENGINEER: .....

T.S. Compt

DATE: 26/11/14



Product Service

**TÜV SÜD BABT**  
Octagon House,  
Concorde Way, Sagensworth North,  
Fareham, PO15 5RL,  
United Kingdom



25 May 2016

**Declaration of MOB1 Battery pre-discharge**

The Ocean Signal rescueME MOB1 batteries supplied to TUV for operational life testing had been pre-discharged by 250mAh. This was achieved by drawing 100mA from each battery for 2.5 hours.

Signed on behalf of Ocean Signal Ltd.,

Simon Nolan  
Chief technical Officer

**Registration No**  
4627101  
**IST No.**  
938 4376 07  
**Registered Office**  
27 New Dover Road  
Canterbury  
Kent  
CT1 3DM



Product Service

**TÜV SÜD BABT**  
Octagon House,  
Concorde Way, Sagensworth North,  
Fareham, PO15 5RL,  
United Kingdom

Unit 4  
Delivan Way  
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CT9 4NN  
**Telephone**  
+44 (0)1843 282930  
**email**  
info@oceansignal.com  
**web**  
www.oceansignal.com

25 May 2016

**Declaration of MOB1 Battery pre-discharge**

The Ocean Signal rescueME MOB1 batteries supplied to TUV for operational life testing had been pre-discharged by 250mAh. This was achieved by drawing 100mA from each battery for 2.5 hours.

Signed on behalf of Ocean Signal Ltd.,

Simon Nolan  
Chief technical Officer

**Registration No**  
4627101  
**IST No.**  
938 4376 07  
**Registered Office**  
27 New Dover Road  
Canterbury  
Kent  
CT1 3DM



Product Service

|                       |  |            |
|-----------------------|--|------------|
| <b>Document Type</b>  | <b>Document No.</b>                                  |            |
|                       | <b>Issue</b>   | 0A.00      |
| Approved:             | <b>Date Last Amended</b>                             | 10/05/2019 |
|                       | <b>Last Amended by</b>                               | S Nolan    |
| <b>Document Title</b> | <b>MOB1/ AIS-Link worst case current consumption</b> |            |

The MOB1 / AIS-Link use the same PCB and same product firmware and therefore operate in exactly the same way.

The product transmits signals in the AIS Band channel A and B alternately as per the MSLD specification. A burst of eight transmissions are sent every minute separated by 75 AIS Slots (2 seconds). If enabled the device will also send a DSC relay message once turned on which will repeat every 5 minutes. If the unit has a GPS position it will insert an additional DSC message as soon as the product receives a position after being turned on. The five minute timing will then start from this point.

The GNSS receiver uses the GPS constellation and will keep the GPS receiver turned on for the first 790s after turn on irrespective of whether the GNSS receiver gets a position or not. This is required to ensure the GNSS receiver downloads a complete set of ephemeris data at turn on.

After the first 790 seconds the GNSS receiver will be turned on and off as required to the following schedules based upon a GPS signal being present or not.

Without a GPS signal being received the product will turn the receiver on and off for periods of 300s within the first hour of operation thereafter the unit will turn the GPS receiver on for 5 minutes every 20 minutes until the battery goes beyond its cut of voltage and the unit will turn off.

With a GPS signal present the product will turn on to sync the product timer to UTC every minute and then turn off. The average time taken to achieve a lock each minute is 12.05s with GPS on and 47.95s with GPS off.

Over a period of 24 hours operation this will mean the GPS will be on as shown below.

|              | With GNSS Signal present on time | With GNSS Signal present off time | Without GNSS Signal present on time | Without GNSS Signal present off time |
|--------------|----------------------------------|-----------------------------------|-------------------------------------|--------------------------------------|
|              | 790s                             |                                   | 790s                                |                                      |
|              | 1427*12.05                       |                                   | 1500                                | 1500                                 |
|              |                                  |                                   | 55*300                              | 55*1200+110                          |
| <b>Total</b> | 17985.4s                         | 68414.6s                          | 18790                               | 67610                                |

From these calculations it can be seen that the worst case test will be without a GNSS signal present.





Product Service

|                       |  |             |  |
|-----------------------|--|-------------|--|
| <b>Document Type</b>  | <b>Document No.</b>                                  |             |  |
|                       | <b>Issue</b>   | 0A.00       |  |
|                       | <b>Date Last Amended</b>                             | 10/5/2018   |  |
|                       | <b>Last Amended by</b>                               | Simon Nolan |  |
| <b>Document Title</b> | <b>MOB1/ AIS-Link worst case current consumption</b> |             |  |

**Pre-discharge Current**

Useful Battery Life 7 years so battery self-discharge equivalent to 14 years required.

Energizer 123 1.5Ah self-discharge 1% per year as per manufactures data

14 year self-discharge = 196.88mAh

GPS tests maximum 21 over life of product = 21 x 0.672mAh = 14.11mAh

DSC Tests 2 per year = 14 x 2 x 0.247mAh = 6.93mAh

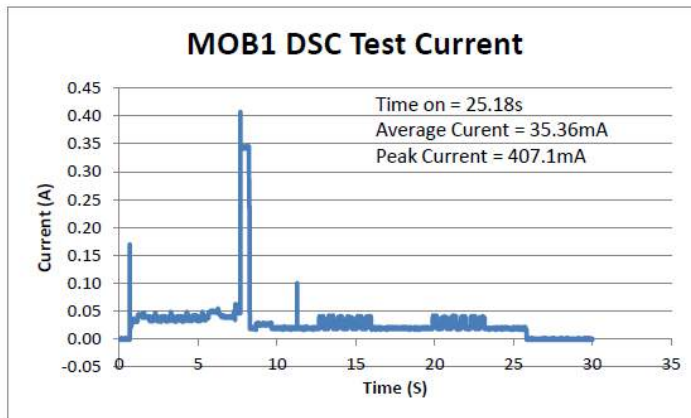
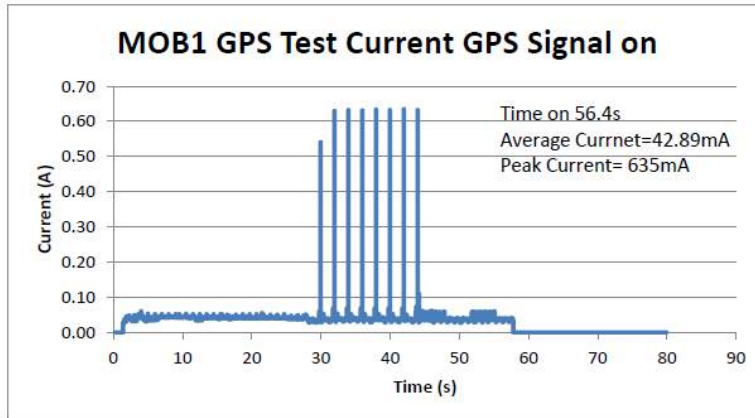
Self tests 1 per month = 168 x 0.149mAh = 25.1mAh

**Total self-discharge = 243.0mAh**



Product Service

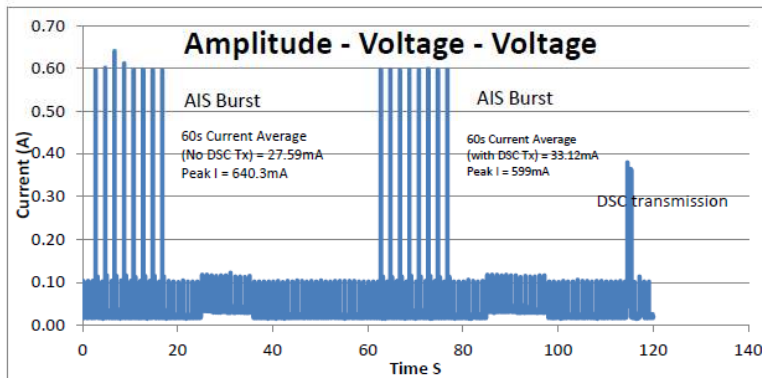
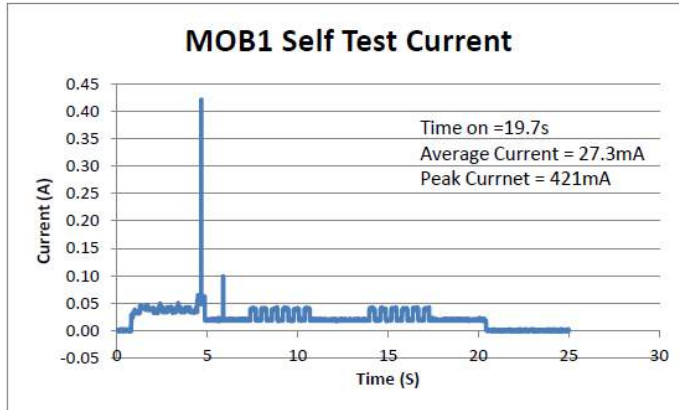
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|-----------------------|--|-------------|
| <b>Document Type</b>  | <b>Document No.</b>                                  |             |
|                       | <b>Issue</b>   | 0A.00       |
|                       | <b>Date Last Amended</b>                             | 10/5/2018   |
|                       | <b>Last Amended by</b>                               | Simon Nolan |
| <b>Document Title</b> | <b>MOB1/ AIS-Link worst case current consumption</b> |             |





Product Service

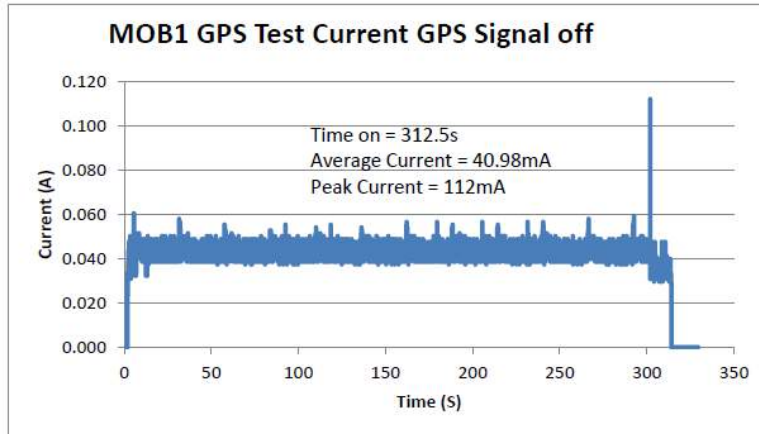
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| <b>Document Type</b>  | <b>Document No.</b>                                  |             |
|                       | <b>Issue</b>   | 0A.00       |
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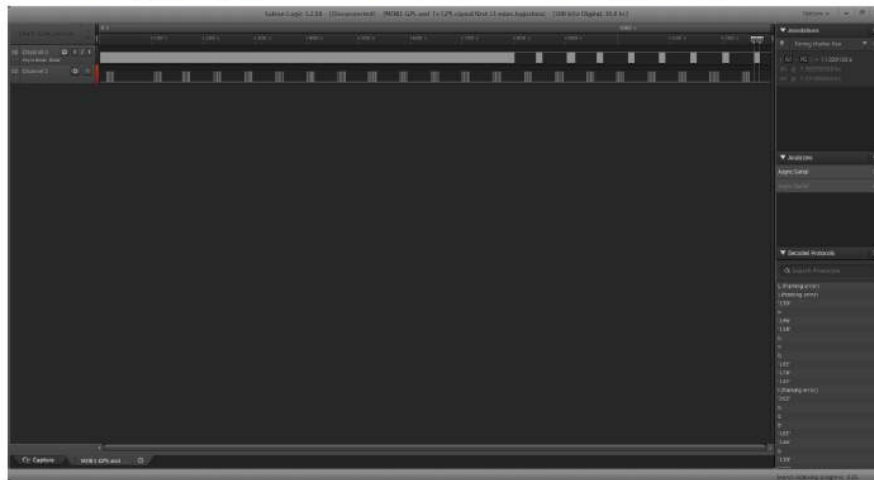


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| <b>Document Type</b>  | <b>Document No.</b>                                  |             |
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Pictures supporting GPS worst case current consumption calculations

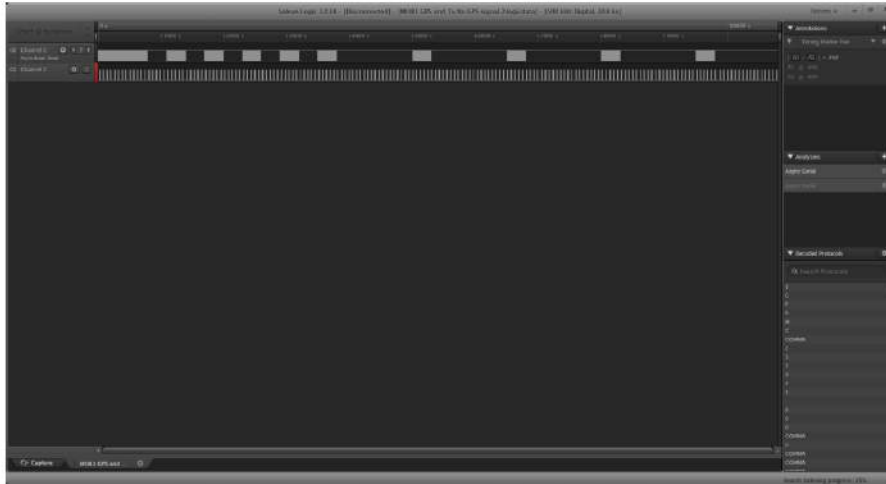


Trace 1 shows GPS output for unit with GPS signals present. On for first 13 minutes then on and off ~11.5s on each minute. Trace 2 shows the AIS transmissions every minute.



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|                       | <b>Date Last Amended</b>                             | 10/5/2018   |
|                       | <b>Last Amended by</b>                               | Simon Nolan |
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Trace 1 shows the GPS output for unit without GPS signals present. On for 13 minutes then off/on for five minutes up to first hour then on for 5 minutes every 20 minutes. Trace 2 shows AIS transmissions every minute.

