PUBLIC ENTERPRISE TESTING CENTER «OMEGA»

Approved by
acting director
PE TC "OMEGA"
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April 27, 2010

TEST REPORT No. 10/26
Issue 1

on type approval of COSPAS-SARSAT Emergency Position Indicating Radio Beacon (EPIRB) SafeSea model E100G class 2, Manufacturer Coverise Ltd., Great Britain

Volume 2
The technical documentation submitted by the Manufacturer for testing

Sevastopol
2010

CONTENTS

1. APPLICATION
FOR A COSPAS-SARSAT 406 MHZ BEACON TYPE APPROVAL CERTIFICATE
SIGNED BY THE MANUFACTURER
TO CONFIRM THE TECHNICAL DETAILS OF THE BEACON

section 5 a. i. – v. C/S T.007 annex G.1 and annex G.2

APPLICATION FOR A COSPAS-SARSAT 406 MHz BEACON TYPE APPROVAL CERTIFICATE

G.1 INFORMATION PROVIDED BY THE BEACON MANUFACTURER

Beacon Manufacturer and Beacon Model

Beacon Manufacturer	Coverise Ltd
Beacon Model	SafeSea E100G (class 2)
Other Model Names	

Beacon Type and Operational Configurations

Beacon Type	**Beacon used while:**	**Tick where appropriate**
EPIRB	Floating in water or on deck or in a safety raft	✓
PLB	On ground and above ground	
	On ground and above ground and floating in water	
ELT Survival	On ground and above ground	
	On ground and above ground and floating in water	
ELT Auto Fixed	Fixed ELT with aircraft external antenna	
ELT Auto Portable	In aircraft with an external antenna	
	On ground, above ground, or in a safety raft with an integrated antenna	
ELT Auto Deployable	Deployable ELT with attached antenna	
Other (specify)		

Beacon Characteristics

Characteristic	**Specification**
Operating frequency	406.037 .....MHz
Operating temperature range	Tmin = -20°C.... Tmax=55°C.....
Operating lifetime	48.....hours

Characteristic	Specification
Battery chemistry	Lithium Manganese Dioxide
Battery cell model name, size and number of cells	Energizer 123 (EL123AP), IEC CR17345, 34.5mm height x 17mm diameter, 9cells
Battery cell manufacturer	Energizer
Battery pack manufacturer and part number	Coverise Ltd; LB2E
Battery pack replacement period	5 ..... years
Oscillator type (e.g. OCXO, MCXO, TCXO)	TCXO
Oscillator manufacturer	Rakon Ltd
Oscillator part name and number	E4672LF(T)
Oscillator satisfies long-term frequency stability requirements (Yes or No)	Yes
Antenna type: Integral or Other (e.g. External, Detachable – specify type)	Integral
Antenna manufacturer	Coverise Ltd
Antenna part name and number	N/A
Navigation device type (Internal, External or None)	Internal
Features in beacon that prevent degradation to 406 MHz signal or beacon lifetime resulting from a failure of navigation device or failure to acquire position data (Yes, No, or N/A)	Yes
Features in beacon that ensures erroneous position data is not encoded into the beacon message (Yes, No or N/A)	Yes
Navigation device capable of supporting global coverage (Yes, No or N/A)	Yes
For Internal Navigation Devices	
- Geodetic reference system (WGS 84 or GTRF)	WGS84
- GNSS receiver cold start forced at every beacon activation (Yes or No)	Yes
- Navigation device manufacturer	UBlox
- Navigation device model name and part Number	NEO-5Q
- GNSS system supported (e.g. GPS, GLONASS, Galileo)	GPS

Characteristic	Specification	
For External Navigation Devices		
- Data protocol for GNSS receiver to beacon interface	N/A	
- Physical interface for beacon to navigation device	N/A	
- Electrical interface for beacon to navigation device	N/A	
- Part number of the external navigation interface device (if applicable)	N/A	
- Navigation device model and manufacturer (if beacon designed to use specific devices)	N/A	
Self-Test Mode Characteristics	Self-Test Mode	Optional GNSS Self-Test Mode
- Self-test has separate switch position (Yes or No)	Yes	Yes
- Self-test switch automatically returns to normal position when released (Yes or No)	Yes	Yes
- Self-test activation can cause an operational mode transmission (Yes or No)	No	No
- Self-test causes a single beacon self-test message burst only regardless of how long the self-test activation mechanism applied (Yes or No)	Yes	No
- Results of self-test indicated by (e.g. Pass / Fail Indicator Light, Strobe Light, etc.)	Pass/Fail light	Yes
- Self-test can be activated from beacon remote activation points (Yes or No)	No	No
- Self-test performs an internal check and indicates that RF power emitted at 406 MHz and 121.5 MHz if beacon includes a 121.5 MHz homer (Yes or No)	Yes	No
- Self-test transmits a signal(s) other than at 406 MHz (Yes & details or No)	Yes; 121.5MHz homer	No
- Self-test can be activated directly at beacon (Yes or No)	Yes	Yes
- List of Items checked by self-test	121.5 Homer 406 generation 406 power battery life	GPS receiver operation only
- Self-test transmission burst duration (440 or 520 ms)	520	
- Self-test format bit ("0" or "1")	1	
- Maximum duration of self-test	15seconds	321seconds

Characteristic	Specification	
- Maximum number of GNSS Self Tests (beacons with internal navigation devices only)		5
- Self-test results in transmission of a single burst, irrespectively of the test result (Yes or No)	Yes	
- Maximum number of self-tests during battery pack replacement period	60	
Message Coding Protocols:	(x) Tick the boxes below against the intended protocol options	
User Protocol (tick where appropriate)		
		Maritime with MMSI
		Maritime with Radio Call Sign
		EPIRB Float Free with Serial Number
		EPIRB Non Float Free with Serial Number
		Radio Call Sign
		Aviation
		ELT with Serial Number
		ELT with Aircraft Operator and Serial Number
		ELT with Aircraft 24-bit Address
		PLB with Serial Number
		National (Short Message Format)
		National (Long Message Format)
Standard Location Protocol (tick where appropriate)		
	✓	EPIRB with MMSI
	✓	EPIRB with Serial Number
		ELT with 24-bit Address
		ELT with Aircraft Operator Designator
		ELT with Serial Number
		PLB with Serial Number
National Location Protocol (tick where appropriate)		
	✓	National Location: EPIRB
		National Location: ELT
		National Location: PLB
User Location Protocol (tick where appropriate)		
	✓	Maritime with MMSI
	✓	Maritime with Radio Call Sign
	✓	EPIRB Float Free with Serial Number
	✓	EPIRB Non Float Free with Serial Number
	✓	Radio Call Sign
		Aviation
		ELT with Serial Number
		ELT with Aircraft Operator and Serial Number
		ELT with Aircraft 24-bit Address
		PLB with Serial Number

Characteristic	Specification
Beacon includes a homer transmitter (if yes identify frequency of transmission) -Homer Transmit Power	121.5MHz..... MHz 20.....dBm
-Homer Duty Cycle -Duty Cycle of Homer Swept Tone	98..... % 37..... %
Beacon includes a strobe light (Yes or No) - Strobe light intensity - Strobe light flash rate	Yes >0.75cd 2.5seconds
Beacon transmission repetition period satisfies C/S T.001 requirement that two beacon's repetition periods are not synchronised closer than a few seconds over 5 minute period, and the time intervals between transmissions are randomly distributed on the interval 47.5 to 52.5 seconds (Yes or No)	Yes
Other ancillary devices (e.g. voice transceiver, remote control, external audio and light indicators, external activation device). List details on a separate sheet if insufficient space to describe.	N/A
Beacon includes automatic activation mechanism (Yes or No) Specify type of automatic beacon activation mechanism	Yes; Water Activation
Beacon includes software or hardware features and functions not listed above and non-related to 406 MHz (Yes or No) List features and use a separate sheet if insufficient space	No

Dated: 17/12/2009..... Signed: David Sheekey, Product and Approvals Manager.....
(Name, Position and Signature of Beacon Manufacturer Representative)

2. ANALYSIS AND CALCULATIONS PRE-TEST BATTERY DISCHARGE AT AMBIENT TEMPERATURE BEFORE THE OPERATING LIFETIME AT MINIMUM TEMPERATURE TEST.

Section 5 c. C/S T.007

EPIRB BATTERY REPORT

coverise

Product: E100G and E100 EPIRB

Description of EPIRBs

The Coverise EPIRB has four different variants of what is essentially the same basic product.

E100 Class 1 EPIRB
E100 Class 2 EPIRB
E100G Class 1 GPS EPIRB
E100G Class 2 GPS EPIRB

Each of these EPIRBs can fit into either the manual or Automatic release Brackets.

The EPIRB circuitry and mechanical build are exactly the same for each of the four products with the only differences as follows.

Class 1 to Class 2 differences

1) TCXO oscillator is specified and purchased to operate down to -40 degrees C for the Class 1 EPIRB. Apart from the operational temperature the data sheet gives the same figures for output power, voltage supply and current consumption.
2) Battery has four sets of three cells for the Class 1 EPIRB (LB1E) with a combined capacity of 6Ah compared to the three sets of three cells for the Class 2 Battery (LB2E) providing a capacity of 4.5Ah.

GPS to non GPS differences

1) The GPS module, antenna and control electronics (comprising R26, R27, TR2, C134, C31, C45, C135, C30, C94, IC6 C120) are fitted for a GPS module (denoted by the G on the end of the part number) and three additional resistors (R28,R30 and R33) are fitted to the non GPS EPIRB.

Since the units are so similar in build some of the testing can be combined. A GPS unit can emulate a non GPS unit by disabling the GPS module. There is a negligible current difference between a non GPS and GPS EPIRB with GPS disabled.

The difference between Class 1 and Class 2 can only be seen below -20 degrees C. Since the Class 2 EPIRB oscillator is not compensated below -20 degrees C.

The Cospas-Sarsat C/S T.007. Specification 6.4.1 states that if new beacon models that have variants both with and without an internal navigation device are supplied , the variant with the internal navigation device shall be completely tested at a facility accepted by Cospas-Sarsat. The variant without internal navigation device shall undergo the satellite qualitative test, spurious output test, and beacon software test.

EPIRB BATTERY REPORT

coverise

Product: E100G and E100 EPIRB

Date: 15/12/09

E100G & E100 Class 1 & Class 2 Operational modes Current

The operational Current tests were conducted over a time period between 16th November 2009 and 16th December 2009.
A summary of the results is given in the following table. The graphs and further details can be found in Appendix 1.

Description of each operating mode for E100G (same for Class 1 and Class 2)

Off State – Unit is in the off state with only the switch leakage current being drawn.
Self Test – Self test mode (see Manual for description)
GPS Test – GPS test mode (see Manual for description only E100G)
Operating GPS on – Unit on with GPS operational (only E100G)
Operating GPS off – Unit on with GPS disabled
Battery Reset – Battery reset, this is only used once when installing a new battery, to reset the internal timers monitoring the battery usage.

Operating Mode	Peak Current	Capacity Used (C)	Time On Seconds	Average Current	Consumption in mAh
Off State	<100nA	-	Continuous	<100nA	0.0001
Self Test	1284.44mA	0.75696	9.79	77.318mA	0.2103
GPS Test	233.33mA	20.074	320.06	62.72mA	5.576
Operating GPS on	1808.89mA	4.165[1]	50.605	82.3mA	82.3
Operating GPS off	1290.0mA	1.9479[1]	50.605	38.492mA	38.492
Battery Reset	1286.67mA	0.90895	28.756	31.609mA	0.2525

Note 1 Capacity used is over one full transmit cycle period only (Average 50S).

The Class 1 Battery lifetime was tested commencing on 21st November 2009. The unit was placed in chamber at -40ºC with a fresh LB1E battery pack.
The After a time period of 54 hours 59 minutes and 13 seconds the unit was still operating to the specification. At this point the test was terminated
The Class 2 Battery lifetime was tested commencing on 16th November 2009. The unit was placed in chamber at -20ºC with a fresh LB2E battery pack.
After a time period of 73hours 36 minutes and 11 seconds the unit was still operating to the specification. At this point the test was terminated.

	Class 1 Test -40ºC		Class 2 Test -20ºC
Start time of test	10:07.20.9 21/9/2009		18:18.26.5 16/9/2009
End time of test	17:06:34.7 23/9/2009		19:54:37.8 20/9/2009
Battery capacity used during test	9319 C		12486.93 C
Battery capacity used	2.589Ah		3.469Ah
Time unit was on during test	197953s (54.9h)		2644971s (73.6h)
Battery Capacity used to 48 hours operation	2.329Ah		2.231Ah
Maximum Current	1.536A		1.536A
Average Current	48.805mA		47.126mA

During testing the frequency, output power and digital message were monitored as specified in C/S T.007.

EPIRB BATTERY REPORT

coverise

Product: E100G and E100 EPIRB

Cospa-Sarsat EPIRB Battery Information and Discharge calculations for E100G EPIRB

Battery discharge current was measured for each of the operating states as detailed in Appendix A.

Supplied Data / Assumptions

Battery replacement interval	: 5 Years
Initial Battery Capacity Class 2	: 4500mAh
Initial Battery Capacity Class 1	: 6000mAh
Battery Self Drain	: 0.6% per year
Self Test Interval	: 12 tests per year
GPS Test Interval	: 1 test per year
Battery reset	: 1 test per battery life

The GPS on/off cycle without GNSS Satellites in view is as follows
10 minutes on, 20 minutes off, 10 minutes on, 20 minutes off, 5 minutes on, 20 minutes off the 5 / 20 is then repeated continuously.

Battery Preconditioning Discharge Time Calculations

Battery self Drain = Capacity – (1-self drain/year%)$^{\text{replacement Interval}}$ x Capacity
Class 2 Battery Self drain = 4500 – $(1\text{-}0.006)^5$x4500 = 133.39mAh
Class 1 Battery Self drain = 6000 – $(1\text{-}0.006)^5$x6000 = 177.85mAh

Off Drain = Hours per year x replacement Interval x off Current
Off Drain = 365x24x5x100x10^{-9} = 4.38mAh

Self Test Drain = Self tests per battery x self test current x self test duration (in hours)
Self Test Drain = 12x5 x 77.318 x (9.79/3600) = 12.616mAh

GPS Test Drain = GPS test per Battery x GPS-test Current x GPS test duration (in hours)
GPS Test Drain = 1x5 x62.72 x (320.06/3600) = 27.881mAh

Battery Reset drain = Average Reset Current x Duration of reset (in hours)
Battery Reset Drain = 1x 31.609 x (28.756/3600) = 0.252mAh

Total Drain = Battery Self Drain + Off Drain + Self Test Drain + GPS Test Drain + Battery reset

Class 2 Total Drain = 133.39 + 4.38 + 12.616 + 27.881 + 0.252
Class 2 Total Drain =178.519mAh.

Class 1 Total Drain = 177.85 + 4.38 + 12.616 + 27.881 + 0.252
Class 1 Total Drain =222.98mAh.

Worst case Drain= Battery Self Drain + 1.65x(Off Drain + Self Test Drain + GPS Test Drain + Battery reset)
Worst Case Drain Class 2 = 133.39 + 1.65(4.38+12.616+27.881+0.252) = 207.853mAh.

EPIRB BATTERY REPORT

coverise

Product: E100G and E100 EPIRB

Worst Case Drain Class 1 = 177.85 + 1.65(4.38+12.616+27.881+0.252) = 252.313mAh.

The Battery preconditioning discharge time = Worst Case drain / Operational Current

For an E100G Class 2 GPS EPIRB
Assuming the discharge is carried out, without any GNSS Satellite in view.

The current drain during the 1st hour for a GPS unit is 2x(82.3x10/60 + 38.492x20/60) = 53.095mAh
The subsequent current is (82.3x5/60 + 38.492x20/60) = 19.689 mAh every 25 minutes
Current drain in 5 minutes of operation with GPS on = 82.3 x 5/60 = 6.858mAh
Current drain in 16 minutes of operation with GPS off = 38.492 x 16/60 = 10.26mAh

Total current drain after 4 hours 16 minutes is 53.095+7x 19.689 + 6.858 +10.26 = 208.036mAh

E100G Class 2 GPS EPIRB Discharge Time will be 4 hours 16 minutes

For an E100G Class 1 GPS EPIRB
Assuming the discharge is carried out, without any GNSS Satellite in view.

The current drain during the 1st hour for a GPS unit is 2x(82.3x10/60 + 38.492x20/60) = 53.095mAh
The subsequent current is (82.3x5/60 + 38.492x20/60) = 19.689 mAh every 25 minutes
Current drain in 2 minutes of operation with GPS on = 82.3 x 2/60 = 2.743mAh

Total current drain after 5 hours 12 minutes is 53.095+10x 19.689 + 2.743 = 252.728mAh

E100G Class 1 GPS EPIRB Discharge Time will be 5 hours 12 minutes

The testing carried out by Coverise to demonstrate operational life of the batteries did not include a battery pre discharge. This can be compensated for by extending the operational time requirements and is justified by the following.

For -40ºC tests the capacity of the battery was reduced to 43.14% of capacity at 20ºC.
The pre discharge equivalent at -40ºC would be the 20ºC discharge time x 43.14%
312 min x0.4314 = 134.597 minutes or 2 hour 15 minutes

The EPIRB lasted close to seven hours over the required time demonstrating that the EPIRB will meet the lifetime requirements at -40ºC

For -20ºC tests the capacity of the battery was reduced to 77.09% of capacity at 20ºC.
The pre discharge equivalent at -20ºC would be the 20ºC discharge time x 77.09%
256 min x0.7709 = 197.35 minutes or 3 hour 18 minutes

The EPIRB lasted more than 25 hours over the required time demonstrating that the EPIRB will meet the lifetime requirements at -20ºC

EPIRB BATTERY REPORT

coverise

Product: E100G and E100 EPIRB

Cospas-Sarsat EPIRB Battery Information and Discharge calculations for E100 EPIRB

Clearly the GPS version of the product (E100G) draws more current than the non GPS Model (E100) and will meet the lifetime requirements since the unit has the same battery capacity and needs less current. The calculations for pre discharge are shown below for completeness.
Battery discharge current was measured for each of the operating states as detailed in Appendix A.

Supplied Data / Assumptions

Battery replacement interval	: 5 Years
Initial Battery Capacity Class 2	: 4500mAh
Initial Battery Capacity Class 1	: 6000mAh
Battery Self Drain	: 0.6% per year
Self Test Interval	: 12 tests per year
Battery reset	: 1 test per battery life

Battery Preconditioning / Discharge Time Calculations

Battery Preconditioning Discharge Time Calculations

Battery self Drain = Capacity – (1-self drain/year%)$^{\text{replacement Interval}}$ x Capacity
Class 2 Battery Self drain = 4500 – $(1\text{-}0.006)^5$x4500 = 133.39mAh
Class 1 Battery Self drain = 6000 – $(1\text{-}0.006)^5$x6000 = 177.85mAh

Off Drain = Hours per year x replacement Interval x off Current
Off Drain = 365x24x5x100x10^{-9} = 4.38mAh

Self Test Drain = Self tests per battery x self test current x self test duration (in hours)
Self Test Drain = 12x5 x 77.318 x (9.79/3600) = 12.616mAh

Battery Reset drain = Average Reset Current x Duration of reset (in hours)
Battery Reset Drain = 1x 31.609 x (28.756/3600) = 0.252mAh

Total Drain = Battery Self Drain + Off Drain + Self Test Drain + Battery reset

Class 2 Total Drain = 133.39 + 4.38 + 12.616 + 0.252
Class 2 Total Drain =150.638mAh.

Class 1 Total Drain = 177.85 + 4.38 + 12.616 + 0.252
Class 1 Total Drain =195.098mAh.

Worst case is Drain= Battery Self Drain + 1.65x(Off Drain + Self Test Drain + GPS Test Drain + Battery reset)
Worst Case Drain Class 2 = 133.39 + 1.65(4.38+12.616+0.252) = **161.85mAh.**

Worst Case Drain Class 1 = 177.85 + 1.65(4.38+12.616+0.252) = **206.31mAh.**

The Battery preconditioning discharge time = Worst Case drain / Operational Current

For an E100 Class 1 and 2 EPIRB

The average current drain is 38.492mAh

For Class 1 E100 the discharge period will be 5 hors 22 minutes.

Total current drain after 5 hours 22 minutes is 38.492 x322/60 = 206.57mAh

For Class 2 E100 the discharge period will be 4 hours 13 minutes.

Total current drain after 4 hours 13 minutes is 38.492 x253/60 = 162.3mAh

APPENDIX A

Results of Current tests for E100 and E100G EPIRB Operating Modes

EPIRB BATTERY REPORT

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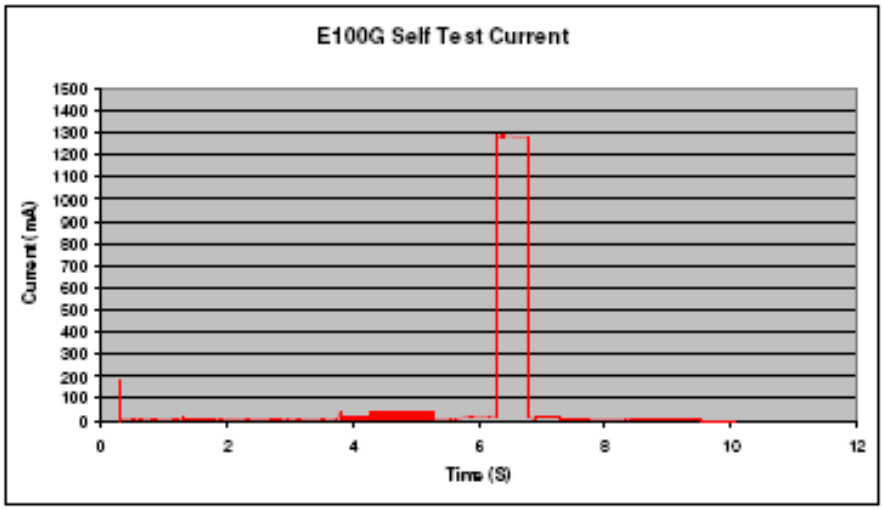
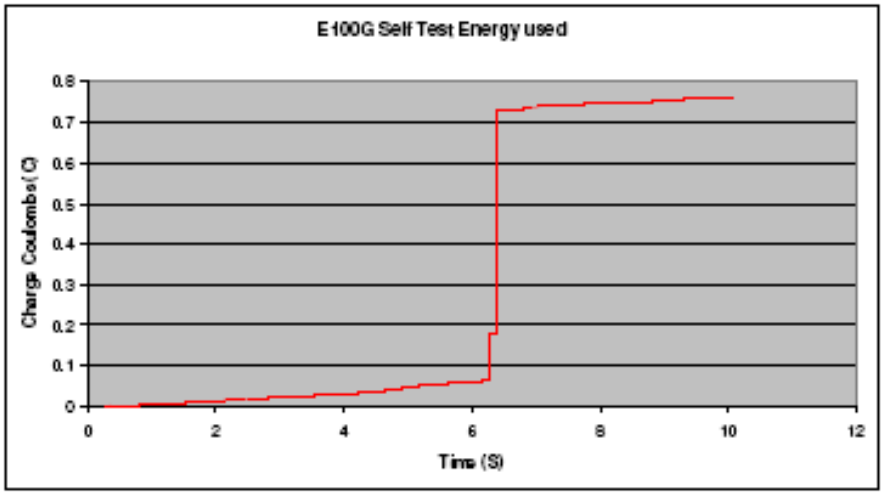
Product: E100G and E100 EPIRB

EPIRB E100G and E100 Self Test Current results





Maximum Current	1284.4mA
Charge Used	0.75696C
Time for self Test	9.79S
Average Current	77.318mA
Power Consumption	0.2103Ah

EPIRB BATTERY REPORT

coverise

Product: E100G and E100 EPIRB

Page: 10 of 27
Date: 15/12/09

E100G Normal Operation Current Test from switch on
GPS Enabled

121.5 Homing beacon not switched on during first period. Average current is calculated from end of first 406MHz transmission to the end of the second 406MHz transmission.

Maximum Current	1808.89mA
Charge Used	4.165C
Time for self Test	50.6S
Average Current	82.3mA
Power Consumption	82.3mAh

EPIRB BATTERY REPORT

coverise

Product: E100G and E100 EPIRB

Page: 11 of 27
Date: 15/12/09

E100G and E100 Normal Operation Current Test from switch on
(GPS Disabled on E100G)

121.5 Homing Beacon not switched on during first period. Average current is calculated from end of first 406MHz transmission to the end of the second 406MHz transmission.

Maximum Current	1290mA
Charge Used	1.947892C
Time for self Test	50.605S
Average Current	38.492mA
Power Consumption	38.492mAh

EPIRB BATTERY REPORT

coverise

Product: E100G and E100 EPIRB

Page: 12 of 27
Date: 15/12/09

E100G GPS Self Test Current Consumption test

Maximum Current	233.33mA
Charge Used	20.074C
Time for self Test	320.06S
Average Current	62.72mA
Power Consumption	5.576mAh

EPIRB BATTERY REPORT

coverise

Product: E100G and E100 EPIRB

Page: 13 of 27
Date: 15/12/09

E100G and E100 EPIRB Battery Counter Reset Current Tests

Maximum Current	1286.67mA
Charge Used	0.909C
Time for self Test	28.756S
Average Current	31.6mA
Power Consumption	0.2525mAh

3. THE MANUFACTURER'S DECLARATION ABOUT OPERATOR SELECTABLE MODE OF OPERATION (THAT DRAWS THE MAXIMUM BATTERY ENERGY AND THE MAXIMUM PULSE CURRENT).

Section 5 d. C/S T.007

coverise

T.007 5.d Battery Consumption Modes

From the analysis given in section 5.c, it can be seen that the worst case mode that draws the maximum battery is for the E100G model equipped with GNSS receiver.

There are no other modes that draw peak currents higher than during normal operation or test modes.

4. BEACON OPERATING INSTRUCTIONS AND A TECHNICAL DATA SHEET. DECLARATION ABOUT FIRMWARE VERSION.

Section 5 e. C/S T.007

coverise

T.007: 5.e Operating Instructions and Technical Data Sheet

The user manual follows this page. The technical data sheet is included in the user manual.

Ocean Signal

SafeSea E100
SafeSea E100G

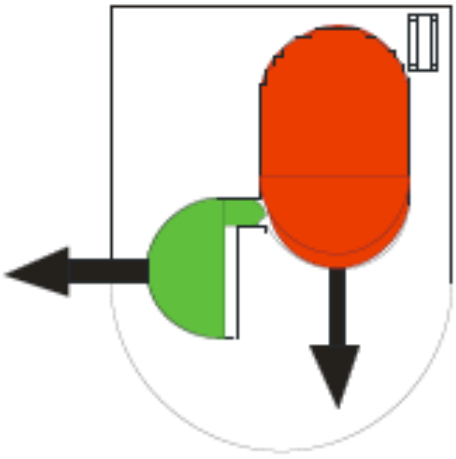
Manual

In Case of Emergency

Remove the EPIRB from its mounting or housing

To manually activate EPIRB

Break the switch cover



Slide and hold the Green switch to the left. Slide the Red switch into the down position

Remove the lanyard cover, holding on to the free end of the lanyard and throw the EPIRB into the water

EPIRB Programming Details

Insert your EPIRB programming details, as indicated on the side of your EPIRB, into the form below.

UIN: .....

Vessel Name: .....

MMSI: .....

Country: .....

Call Sign: .....

Contents

1: Introduction

WARNING

USE ONLY IN SITUATIONS OF GRAVE AND IMMINENT DANGER

This manual provides valuable in formation for the installation, operation and maintenance for your SafeSea E100/G.

It covers the operation for both the:

SafeSea E100
&
SafeSea E100G (GPS operation)

Please completely read this manual before using your EPIRB.

2: Registration

WARNING

THE OWNER OF THIS 406MHz EPIRB MUST REGISTER IT WITH THE APPROPRIATE NATIONAL AUTHORITY.

FAILURE TO REGISTER THIS EPIRB MAY RESULT IN A FINE, SLOWING THE RESCUE PROCESS OR EVEN LOSS OF LIFE.

All 406MHz EPIRBs are programmed with a unique identity number (UIN), which is based upon the country of registration. This is normally the country to which the vessel is flagged. Registration provides the Search and Rescue authorities with the correct emergency contact details, which will speed up the rescue process.

Once registration has been performed you should receive a "decal" sticker which must be affixed to the area on the EPIRB marked **"Attach proof of registration in this area"**. This decal is your proof of registration.

Useful registration contacts are:

UK EPIRB Registry
HM Coastguard (Southern)
Pendennis Point
Castle Drive
Falmouth
TR11 4WZ
For online UK registration goto:-

http://www.ukshipregister.co.uk/mcga07-home/emergencyresponse/mcga-searchandrescue/epirb.htm

NOAA/SARSAT
NSOF, E/SP3
4231 Suitland Road
Suitland, MD 20746
USA

For online US Registration goto:-

https://beaconregistration.noaa.gov/rgdb/

This EPIRB is a radio transmitter; as such, you should update your existing radio license to include this EPIRB.

When an EPIRB is transferred to a new vessel, the EPIRB must be re-programmed to include the relevant information as required by the country

controlling the new vessel. As previously mentioned, the EPIRB UIN also contains the country code; therefore, changing the country to which the vessel is flagged will result in the EPIRB needing to be re-programmed.

Some countries, UK, USA, Canada and Australia, do not need to have the EPIRB re-programmed when transferring it to a new vessel. However, re-registration is mandatory to ensure that all emergency contact details, relating to the EPIRB, are kept up to date.

Note: It is very important to ensure your EPIRB is registered with your National Authority. The requested registration information will ensure that the rescue authorities quickly identify the type of vessel they are searching for and make contact to ensure the alert is not a false alarm. Although failure to register your beacon will not stop you being rescued, it may cause unnecessary delays and effort in the rescue centre.

2.1: Programming Details

Your EPIRB is supplied with a label titled "Programming Details", this contains areas where the programming details of the EPIRB can be marked with an indelible permanent maker. This information includes:

1) UIN (Unique Identity Number).
2) Vessel Name.
3) MMSI.
4) Country.
5) Call Sign.

If this label has not been provided with the EPIRB information pre-inserted then enter this information.

Affix the label to the left side of the EPIRB in the area provided. Then place the clear label provided over the first label.

It is advised that this information is also copied into the section provided on Page 3 of this manual.

3: Installation

WARNING

ENSURE THAT THIS EPIRB IS MOUNTED AWAY FROM ALL MAGNETIC SOURCES.

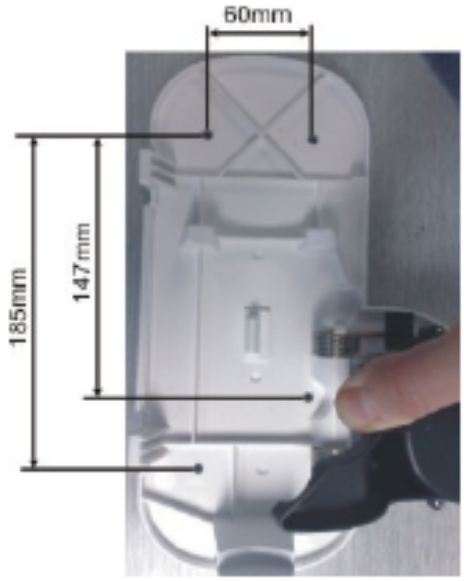
INCORRECT INSTALLATION MAY CAUSE THE EPIRB TO OPERATE INCORRECTLY.

3.1: Location

The location selected must be sufficiently robust to support the weight of the complete installation. Exposure to the elements and surrounding hazards, along with vibration should also be taken into consideration when choosing the location. To ensure that the EPIRB will always float free from the sinking vessel ensure that the float free housing is located high up on the superstructure, free from any obstructions and located in a position that it will not be trapped, regardless of the angle the sinking vessel may be in.

Ensure that when mounting that the EPIRB is mounted in a position of antenna up.

3.2: Float Free Housing



Using the dimensions, indicated above, use the N°6 x 5/8" screws provided to secure the float free housing to the chosen structure.

When selecting a position for the float free housing, ensure that EPIRB has the ability to float free of the housing without any obstructions.

3.2.1: Loading the EPIRB

1) Lift the HRU back.

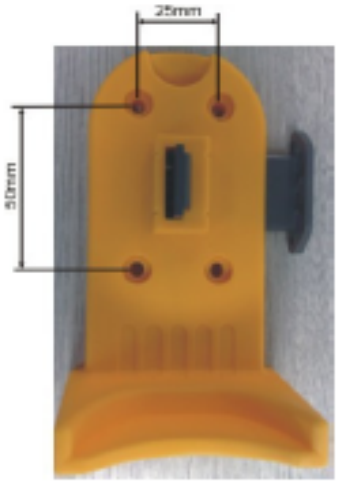
2) Load the EPIRB, controls facing up, into the location seat, ensuring to carefully fold the antenna back behind the EPIRB.

3) Gently lower the HRU, this device also clamps the EPIRB in place.

4) Place the housing cover over the back, by placing the locating hole (on the side of the housing) over the clips.

5) Push and rotate the housing release knob into the locked position.

3.3: Mounting Cradle



Using the dimensions, indicated above, use the N°6 x 5/8" screws provided to secure the cradle to the chosen structure.

The cradle is designed for internal use. If it is mounted in an external location it is done so at the user's discretion.

3.3.1: Loading the EPIRB

Align the back of the lanyard storage area, situated at the rear of the EPIRB, with the clip mechanism of the cradle and push into place. There will be an audible "click", the EPIRB is now secured in place.

Do not attach the lanyard to any part of the vessels superstructure or other part that will hinder the release of the EPIRB.

4: Operation

WARNING

USE ONLY IN SITUATIONS OF GRAVE AND IMMINENT DANGER.

MISUSE MAY RESULT IN A SEVERE PENALTY.

The EPIRB is designed for best operation whilst floating in water. If used in other situations ensure that the EPIRB is placed in the open, clear of any cover and kept upright. Do not place the EPIRB close to large structures or under cover.

In the case of abandoning ship, if possible, recover the EPIRB and tie to the survival craft, or person via the lanyard.

If used within a life raft hold the EPIRB as high as possible to ensure best operation. However, for optimum operation, it us recommended that the EPIRB be tied to the raft and floated in the water.

4.1: Manual Operation

4.1.1: Releasing from an Enclosure

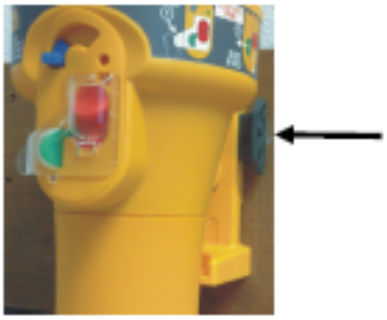
1) Push & rotate, anti-clockwise, the housing release knob.

2) Tilt and lift the housing cover.

3) Lift the release mechanism and remove the EPIRB.

4.1.2: Releasing from a Bracket

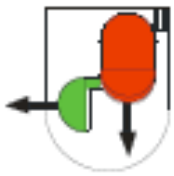
Press the Grey release key on the right hand side of the bracket and remove EPIRB.



4.1.3: Manually Operating the EPIRB

1) Break off the manual switch cover.

2) Slide and hold the Green switch to the left, then slide the **Red** switch into the down position.



The EPIRB will now be operational. The strobe lights will begin to flash at a rate of once every 2.5 seconds as soon as the unit is activated.

It is important that for best performance the EPIRB should be situated in an upright position with a clear view of the sky and as far away from any metallic structures as is possible.

If the EPIRB contains a GNSS receiver, ensure that the GPS antenna is not obstructed and has a complete, unobstructed view of the sky – as indicated on the top of the EPIRB.

A lanyard is provided to tether the EPIRB to the lifeboat or life raft to ensure that it does not drift away. Make sure this is firmly attached.

EPIRB Operational Indicators		
EPIRB Mode	Green Indicator	Red Indicator
Initial EPIRB activation	On for 1 second	
Acquiring GPS position *	1 Flash every 5 seconds	
GPS position acquired *	Flash for 1 second	
121.5MHz Tx **		1 flash, with strobe light, every 2.5 seconds
406MHz Tx		Flashed for 2 seconds
406MHz Tx, with GPS position *	Flashed for 2 seconds	
406MHz Tx, without valid GPS position *		Flashed for 2 seconds

* SafeSea E100G only

** The 121.5MHz homer does not begin transmission until after the first 406MHz transmission – approximately 50 seconds.

4.2: Automatic Operation

The EPIRB will sense when it has been placed in water and automatically begin to operate, after a short delay, in the same manner as described above.

If the EPIRB is mounted in the float free housing or on the bracket this function is disabled until the EPIRB has been removed from either fixture.

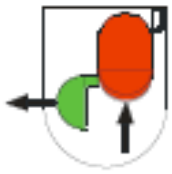
If the EPIRB is mounted in a float free housing, if the vessel sinks, the EPIRB will automatically be ejected from the housing allowing it for float to the surface and begin transmission.

4.3: De-activation

4.3.1: De-activation from Manual operation

If the EPIRB was accidentally activated or the emergency situation has passed, the EPIRB can be manually de-activated.

Slide and hold the Green switch to the left then slide the Red switch into the up position.



4.3.2: De-activation from Automatic Operation

If the EPIRB was automatically activated, by placing in water, remove from the water and dry. The EPIRB will automatically switch off after approximately 30 seconds.

5: False Alerts

False alerts are a serious problem they cause valuable resources to be diverted away from real emergency situation. If a false alert is initiated, by any means, it is important to contact the nearest search and rescue authorities and inform them of the false alert.

Report the following:

1) EPIRB UIN.
2) Date, time and duration.
3) Cause of activation.
4) Location when the alert was activated.
5) Location at time of deactivation.

If the EPIRB was activated by mistake then turn it off. The first emergency transmission will not occur for approximately 50 seconds, if the unit is turned off in this time then EPIRB will not have sent a emergency distress.

If the unit has been dropped into the water then remove from the water and dry the case, wait approximately 30 seconds for the water contacts to de-activate.

If the unit is still flashing after this period, check that the unit has not been manually activated; if so then follow the procedure to manually switch the EPIRB off.

The EPIRB should now be switched off, replace the EPIRB on to the cradle or into the float free housing.

The SafeSea E100/G is fitted with water detection contacts. Although these contacts are hidden to help prevent accidental activation due to heavy sea or weather conditions, the mounting bracket and float free housing is designed to prevent activation of the water contacts in these conditions. Therefore, if the EPIRB is not correctly fitted in it's mounting it is possible that this may cause a false alert situation.

5.1: Disabling the EPIRB

In the unlikely event that your EPIRB develops a fault and does not switch off then to completely disable the unit remove the battery, as described in section 6.4.

6: Maintenance

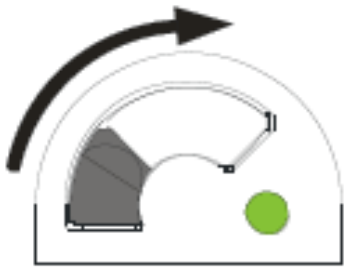
6.1: Self Test Mode

WARNING

TEST TRANSMISSIONS ON THE HOMER FREQUENCY OF 121.5MHz ARE LIMTED, BY THE INTERNATIONAL RADIO REGULATIONS, TO WITHIN THE FIRST FIVE MINUTES OF AN HOUR.

It is recommended that the EPIRB is tested not more than once a month.

The EPIRB self test mode can be initiated by rotating the Grey test switch clockwise and holding for 1 second, until the indicator begins to rapidly flash Green. The test switch should be released once the indicator begins to flash Green.



This will initiate a self test; be prepared to record the number of indicator flashes upon completion of the test.
The self test monitors the 121.5MHz homer RF power, initiates a satellite transmission in order to measure key performance parameters, will monitor the 406MHz RF power, synthesiser lock and battery voltage under load. The self test message is designed to prevent the satellite from forwarding an alert message during self test. After the satellite transmission the strobe light is flashed, demonstrating operation.
A successful test is determined by a series of Green indicator flashes – between one and six flashes, this sequence is repeated after a 2 second delay. A failure is determined by a series if **Red** indicator flashes – between one and five flashes, this sequence is repeated after a 2 second delay.

The series of Green indicator flashes show how many hours use the EPIRB has undergone. The series of **Red** indicator flashes show the failure mode.

Green Indicator Flashes			**Red** Indicator Flashes	
N° of Flashes	N° of Hours Use		N° of Flashes	Mode of Failure
1 Flash	0 to 1hr 59min		1 Flash	121.5MHz homer
2 Flashes	2hrs to 3hrs 59min		2 Flashes	406MHz generation
3 Flashes	4 hrs to 5hrs 59min		3 Flashes	406MHz power amplifier
4 Flashes	6hrs to 7hrs 59min		4 Flashes	Replace battery
5 Flashes	8hrs to 9hrs 59min		5 Flashes	Other failure
6 Flashes	10hrs +			

6.2: GNSS Self Test Mode

WARNING

TESTING THE GNSS RECEIVER IS LIMITED TO 5 TESTS OVER THE LIFETIME OF THE BATTERY.

TESTING THE GNSS RECEIVER EXPENDS SIGNIFICANT AMOUNTS OF ENERGY FROM THE BATTERY PACK AND MAY TAKE UP TO 10 MINUTES TO COMPLETE.

THIS TEST MUST ONLY BE PERFORMED WHERE THE EPIRB HAS A CLEAR AND UNOBSTRUCTED VIEW OF THE SKY. THIS IS REQUIRED TO ALLOW THE GNSS RECEIVER TO ACQUIRE A SIGNAL FROM SUFFICIENT SATELLITES TO ALLOW IT TO DETERMINE A POSITION.

If the user would like confidence that the GNSS receiver is operating correctly then the test can be started by the following method. It is preferable not to perform this test in direct sunlight as it may be make counting the LED's flashes at the end of the test difficult. The EPIRB must remain under observation for the whole of the test to ensure the completion of the test is not missed.

To enter the GNSS self test mode, perform the following procedure:

1) Rotate the Grey test key clockwise and hold for 1 second until the indicator LED begins to rapidly flash Green.
2) Release the test switch and quickly reactivate the test switch whilst the indicator is still rapidly flashing.
3) Hold the switch until the indicator begins flashing Green at a slower rate, continue to hold the test key for 5 seconds.
4) Release the test switch when the indicator changes from flashing Green to a constant **Red**.

The GNSS self test is now active, during the test the indicator will remain **Red** and flash Green once every 5 seconds.

Successful completion of the test is displayed by the indicator flashing Green for 10 seconds with the strobe light flashing every 2.5seconds. A failure upon completion of the test is indicated by the indicator flashing **Red** for 10 seconds with the strobe light flashing every 2.5 seconds.

The GNSS self test can be cancelled at any time by activating the Grey test switch and holding it on for 5 seconds.

The EPIRB is limited to 5 GNSS self tests, the unit will not perform any more than this until the battery is replaced.

If the GNSS self test is initiated and the EPIRB has already performed 5 GNSS self tests, the indicator will flash **Red** for 5 seconds and then power down. If the Grey test key is held on after the indicator has finished flashing **Red**, it will then begin to rapidly flash between **Red** and **Green** to indicate that the EPIRB power is being held on and is needlessly draining the battery reserves.

Note: This test mode is only available on the SafeSea E100G

6.3: Inspection

During the monthly EPIRB self test it is advised that the following inspection is performed.

1) Inspect the EPIRB for obvious signs of damage – including the state of the antenna any creases in the antenna may cause the operation of the EPIRB to be impaired.
2) Confirm that the EPIRB is securely mounted on the bracket or in the float free housing.
3) Inspect the lanyard to ensure it is not attached to any structures.
4) Confirm the battery is within the specified expiry date.
5) If the EPIRB is housed in a float free housing confirm the HRU is within the specified expiry date.
6) Clean the EPIRB and mounting, it is recommended that the EPIRB is cleaned only using a damp cloth.

Note: Other than the battery pack there are no user serviceable parts inside the EPIRB. DO NOT OPEN THE EPIRB, DOING SO WILL INVALIDATE THE WARRANTY AND MAY CAUSE FALSE ALERTS.

6.4: Battery Installation / Replacement

The EPIRB is supplied with a non-hazardous 9V Lithium battery pack. It is recommended that this pack be replaced every 5 years; assuming that the EPIRB has not been used for any emergency use.

The expiry date for the battery will be marked on the battery itself. If this date has been reached then the battery must be replaced to ensure correct operating life of the EPIRB during an emergency situation.

It is recommended that if the EPIRB is operated for any purposes OTHER than the self tests that the battery be replaced. This is to ensure of correct operating life of the EPIRB during an emergency situation.

Dispose of exhausted batteries by returning them to your service agent. Lithium batteries require specialist methods for disposal.
DO NOT INCINERATE!
DO NOT DISPOSE OF AT SEA!

The EPIRB battery can be replaced by using a 3mm Allen Key. To remove the original battery undo the centre bolt situated at the bottom of the EPIRB in the middle of the battery, by turning it anti-clockwise when viewed from the bottom. Once the screw has been completely released the battery can be removed from the main body.

To fit a new battery, offer the battery pack to the EPIRB with the battery pack indent aligned with the main body tab.

Fix the battery to the unit by tightening the centre bolt of the battery pack, using a 3mm Allen key.

6.5: HRU Installation / Replacement

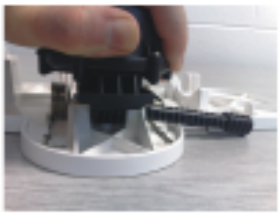
If you have an EPIRB mounted in a float free housing, this will also contain a HRU (Hydrostatic Release Unit). The HRU unit must be replaced every 2 years, the expiry date is marked on the HRU and the front of the housing. If this date has been reached then the HRU must be replaced; failure to do so may result in the HRU not operating correctly during an emergency situation.

1) Lift the release mechanism and remove the EPIRB.

2) Push the HRU down, against the spring and remove the locking pin, carefully remove the HRU from the spring.

3) With the new HRU locate the two retaining ridges (at the bottom of the HRU) on to the spring.

4) Carefully push down on the HRU, against the spring. Have the locking pin ready, with the retaining flange (the flat surface) pointing down.



5) Push the locking pin fully home, the HRU is now ready to load the EPIRB into the housing.

6.6: Service & Warranty

All servicing or repairs of this EPIRB must be carried out by an approved service agent.

For warranty details please refer to the warranty card supplied with this unit.

Please retain the original packaging for your EPIRB. If the EPIRB has to be returned, for any reason, the original packaging should be used.

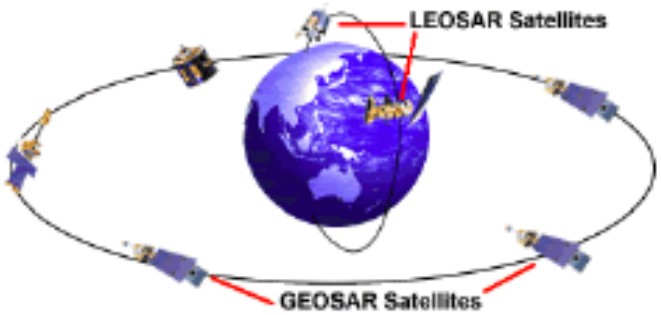
The battery packs used with this EPIRB are classed as non-hazardous under IATA Hazardous Transport Regulation.

- Batteries should be shipped as category 3090, packing instruction 968: part 1.
- EPIRBs with batteries should be shipped as category 3091, packing instruction 969: part 1. (The battery should be removed from the EPIRB before packing, but can be in the same box.)

7: Technical Information

7.1: System Overview

The COSPAS/SARSAT system utilises two satellite arrays to provide distress alert and location data to search and rescue authorities.



GEOSAR – Geostationary Earth Orbit
LEOSAR – Low-altitude Earth Orbit

The GEOSAR system can provide near immediate alerting within the coverage of the receiving satellite.
The LEOSAR system provides coverage of the polar region – beyond the range of the GEOSAR system. It can calculate the location of distress events using Doppler processing techniques and is less susceptible to obstructions which could block a signal in a given direction.

The system is comprised of instruments on board the satellites which detect the signals from the distress beacons. Ground receiving stations, referred to as Local Users Terminals (LUTs) receive and process the satellite downlink signal to generate the distress alerts. The distress alerts, generated by the LUTs, are then received by Mission Control Centres (MCCs) which then forward the alert to Rescue Co-ordination Centres (RCCs), Search and Rescue Points of Contacts (SPOCs) and other MCCs.

7.2: GPS System

The GPS system is a satellite array that enables a GNSS receiver to determine its position around the globe. There are a minimum of 24 satellites orbiting the Earth providing accurate position, velocity and time information.

The SafeSea E100G has a built in GNSS receiver and antenna allowing reception of this positional data. The received position is then inserted into the EPIRB emergency transmission thus enabling search and rescue teams to narrow the search area and increase the effectiveness of the rescue operation.

7.3: Technical Specification

406 MHz Transmitter	
Frequency	406.037 MHz ±1KHz
Output Power	5W Typical
Modulation	Phase +1.1 Radians Pk (16K0G1D)
Encoding	Biphase L
Duration	520mS
Frequency Stability	2 parts per billion / 100mS
Rate	400 bps

121.5 MHz Transmitter	
Frequency	121.5 MHz
Output Power	25-100mW PEP
Modulation	Swept Tone AM (3K20A3X)
Sweep Range / Rate	400 to 1300 Hz
Modulation Depth	96%
Frequency Stability	+50ppm
Duty Cycle	40%

Low Duty Cycle Strobe	
Light Type	Two High Intensity LEDs
Light Colour	White
Output Power	0.75 dc effective candela
Flash Rate	20-30 per minute

Battery	
Type	Lithium Manganese Dioxide ($LiMnO^2$)
Operating	72 hours Minimum
Replacement Interval	5 years

GPS Receiver	
Type	UBlox NEO-5
Sensitivity Cold Start Re-acquisition	-146dBm -162dBm
Centre Frequency	1.57524 GHz
GPS Antenna	Microstrip Patch
Satellites Tracked	50 Channel Engine

General	
Height of Body	215mm
Height of Antenna	210mm
Weight	735grams
Maximum Body diameter	115mm
EPIRB Material / colour	High Impact UV resistant Plastic / High Visibility Yellow

Environmental	
Operating Temperature	Class 1 -40C to +55C Class 2 -20C to +55C
Storage Temperature	Class 1 -40C to +70C Class 2 -30C to +70C
Automatic release depth	4 metres maximum
Waterproof	Exceeds 10m at 20Ca

Approvals	
Cospas-Sarsat	T.001/T.007
Europe	Marine Equipment Directive MED IEC 61097-2 IEC 60945
USA	USCG/FCC Approved FCC ID: XXXXXXXX
Worldwide	IEC 61097-2
IMO Regulations	A.662(16); A.694(17); A.810(19); A.814(19)

* SafeSea E100G only

5. THE MANUFACTURER'S DECLARATION ABOUT ALL OPERATION CONFIGURATIONS

Section 5 f. C/S T.007

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T.007: 5.f Photos of Declared Operating Positions

The E100 and E100G are designed to operate floating in water, on the deck of a boat or in a liferaft. When used in a liferaft, the unit may either be mounted in the canopy or handheld.

6. THE TECHNICAL DATA SHEET FOR THE BATTERY CELLS USED IN THE BEACON AND THE ELECTRIC DIAGRAM OF THE BEACON'S BATTERY PACK

Section 5 g. C/S T.007

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T.007: 5.g Cell and Battery Data

The data sheet for the cells used in the SafeSea E100 series of EPIRBs and the configuration drawing are attached.

The standard battery (LB2E) uses three banks of Energizer Lithium 123 cells, with three cells in each bank. For the class 1 operation, an extra bank of cells is provided in the pack (LB1E).

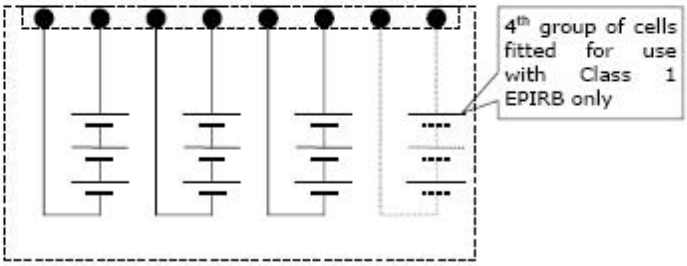

Figure 1: Schematic of SafeSea 100 Series Battery Pack

EPIRB BATTERY REPORT

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Product: E100G and E100 EPIRB

Page: 14 of 27
Date: 15/12/09

Appendix B

E100G and E100 Lithium Battery Information

The Cells used in the EPIRB LB1E and LB2E will be Energizer 123 cells. They are Lithium Manganese Dioxide cells and have the following Characteristics

	Energizer Lithium 123 Photo cells
Designation	IEC: CR17345
Chemical System	Lithium / Manganese Dioxide (Li/MnO_2)
Nominal Voltage	3V
Storage Temp	-40ºC to +60ºC
Operating Temp	-40ºC to +60ºC
Typical Capacity	1500mAh (to 2V)
Typical Weight	17g
Typical Lithium Content	0.55g
Self Discharge at 20ºC	0.6% per year
Capacity at -20ºC	77.09% of nominal typical
Capacity reduction at -40ºC	43.14% of nominal typical

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PRODUCT DATASHEET

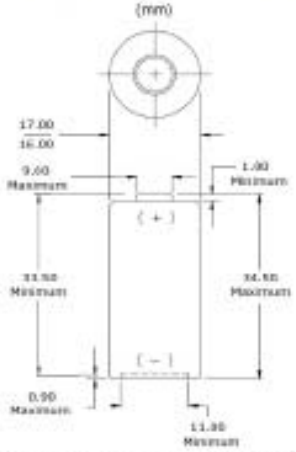
Energizer

+ 44 (0) 208 920 2306

Lithium (123)

Photo

Industry Standard Dimensions



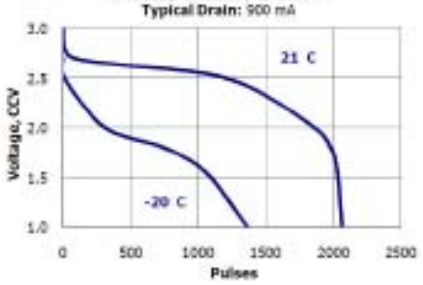
This battery contains a Positive Temperature Coefficient (PTC) safety device to limit current during short circuit conditions.

Specifications

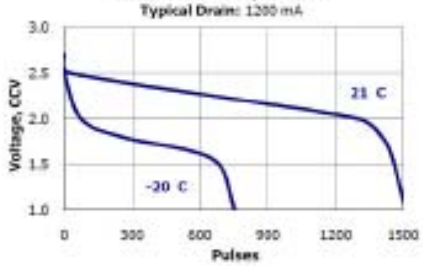
Classification:	"Lithium Photo"
Chemical System:	Lithium / Manganese Dioxide (Li/MnO_2)
Designation:	IEC-CR17345
Nominal Voltage:	3.0 Volts
Storage Temp:	-40°C to 60°C
Operating Temp:	-40°C to 60°C
Typical Capacity:	1500 mAh (to 2.0 volts) (rated at 100 ohms at 21°C)
Typical Weight:	17 grams
Typical Volume:	7.0 cubic centimeters
Max Discharge:	1500 mA continuous (3500 mA pulse)
Max Rev Charge:	2 microampere
Typical Li Content:	0.55 grams
Shipping:	For complete details, please reference:
Global (except US):	Special Provision A45 of the International Air Transport Association Dangerous Goods Regulations
United States:	49 CFR 173.185

Typical Discharge Characteristics

Schedule: 3 sec ON / 27 sec OFF
Typical Drain: 900 mA



Schedule: 3 sec ON / 7 sec OFF
Typical Drain: 1200 mA



Simulated Application Tests

Typical Performance at 21°C

Schedule (time)	Drain (mA)	Load (ohms)	Cutoff Voltage 2.0V (hours)	1.55V (pulses)	1.0V (pulses)
Continuous	---	100	80	---	---
Continuous	1000	---	1.2	---	---
3 sec ON 7 sec OFF	1200	---	---	---	1500
3 sec ON 27 sec OFF	900	---	---	2000	---

Important Notice

This data sheet contains typical information specific to products manufactured at the time of its publication.
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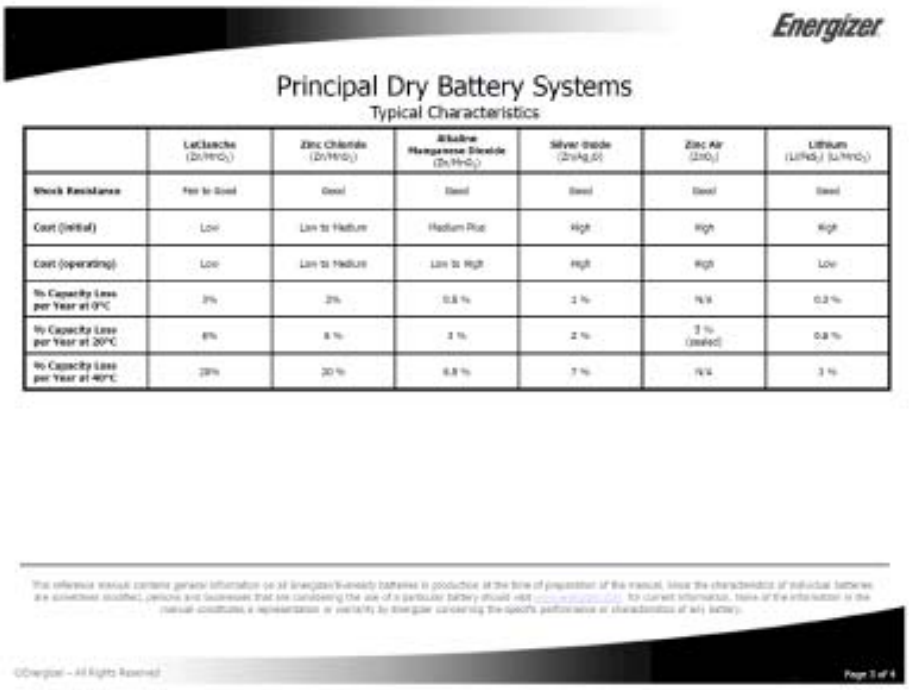
Form No. E8C - 8818EU

Page 1 of 1

Figure 2: Energizer 123 Photo Lithium Cell Data Sheet used in SafeSea E100 Series EPIRBs



Energizer

Principal Dry Battery Systems

Typical Characteristics

	LeClanche (Zn/MnO_2)	Zinc Chloride (Zn/MnO_2)	Alkaline Manganese Dioxide (Zn/MnO_2)	Silver Oxide (Zn/Ag_2O)	Zinc Air (Zn/O_2)	Lithium (Li/FeS_2 / Li/MnO_2)
Shock Resistance	Fair to Good	Good	Good	Good	Good	Good
Cost (Initial)	Low	Low to Medium	Medium Plus	High	High	High
Cost (operating)	Low	Low to Medium	Low to High	High	High	Low
% Capacity Loss per Year at 0°C	3%	2%	0.8 %	1 %	N/A	0.2 %
% Capacity Loss per Year at 20°C	8%	5 %	2 %	2 %	2 % (sealed)	0.8 %
% Capacity Loss per Year at 40°C	28%	20 %	6.8 %	7 %	N/A	3 %

Figure 3: Additional Cell Data, showing capacity loss per year

Page taken from Energizer datasheet "Principal Dry Battery Systems – Typical Characteristics".

7. A COPY OF THE BEACON LABEL

Section 5 h. C/S T.007

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T.007: 5.h Beacon Labelling

EPIRB Labels

Figure 1: E100 Series User Information Label

Common to all models of the E100 and E100G

Figure 2: E100 Product Identification Label

Figure 3: E100G Product Identification Label

Figure 4: User Information Label

Matt finish label for user to write identification data on with an indelible pen. Provided with clear label to cover the writing for protection.

coverise

Auto Release Housing Labels

Figure 5: Float Free Housing Product Identification Labels

Figure 6: User Information Label

User to write HRU installation date on this label with indelible pen. Clear label provided to cover writing for protection.

Figure 7: HR1E Product Identity Label

Central area will be printed with HRU manufacturing date

coverise

Battery Labels

Figure 8: LB1E and LB2E Battery Identification Labels

LB1E for class 1 use, LB2E for Class 2 use.

coverise

Manual Release Housing Labels

Figure 10: Product Identity Label for optional manual release housing

coverise

Instruction Card

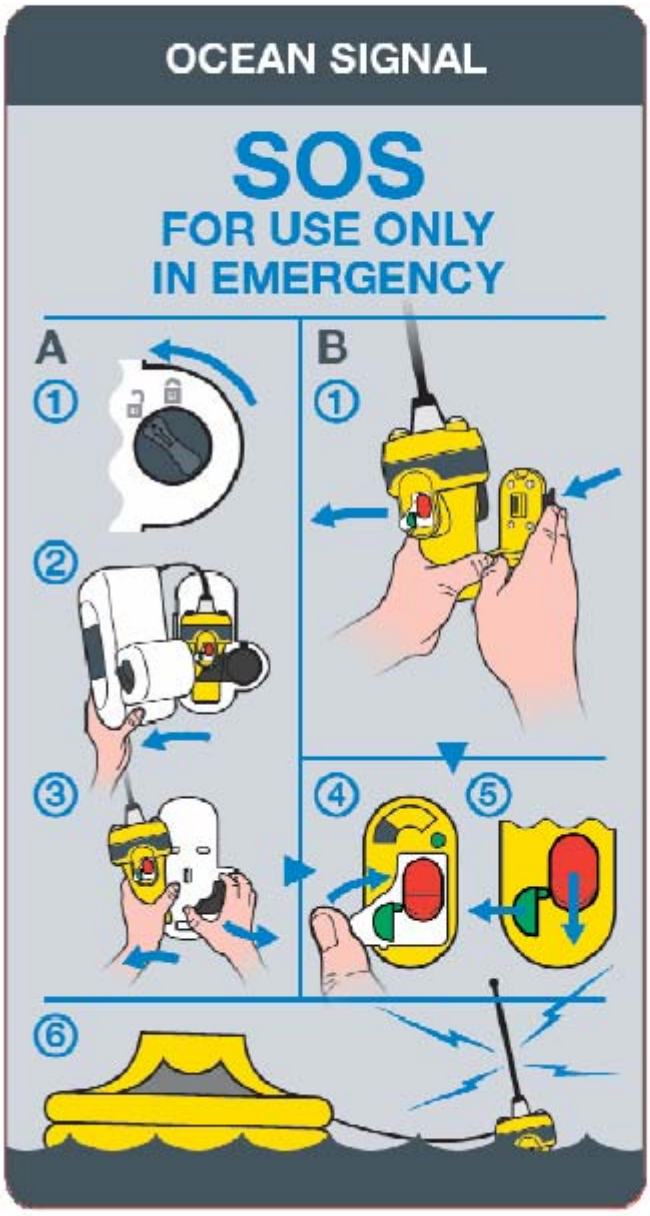


Figure 9: Instruction Card for placing beside the mounted EPIRB.

8. THE TECHNICAL DATA SHEET OF THE REFERENCE OSCILLATOR

Section 5 i. C/S T.007

coverise

T.007: 5.i TCXO Data Sheets

The reference oscillator crystal for the 406MHz transmitter in the SafeSea E100 series EPIRB is made by RAKON Ltd. The following data sheets and sample data are attached.

In the class 1 models, the Rakon E4574LF(T) device is used. In the class 2 model, the Rakon E4672LF(T) device is used.

Figure 3: Reference Crystal Data Sheet - Class 2; Sheet 1 of 2

Figure 4: Reference Crystal Data Sheet - Class 2; Sheet 2 of 2

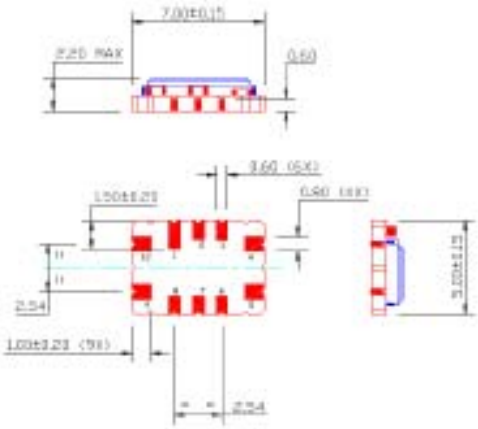
Figure 10: Frequency stability plot for crystal used E100G in Ser No. 0001200014i

Figure 11: Frequency stability plot for crystal used in E100G Ser No. 0001200013i

Oscillator Specification: E4672LF(T)
Issue 3, 9th July 2008, LN4661

Designed for use in "Cospas-Sarsat" Emergency Beacon Applications

Outline in mm

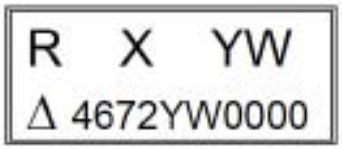


Pad Connections
1. Do not connect
2. NC
3. Do not connect
4. GND
5. RF Output
6. NC
7. NC
8. Tri-State Control (Enable)*
9. Supply, +Vs
10. Do not connect

* leave unconnected if not required

Weight 170mg (typical)

Marking includes
R
Manufacturing identifier (X).
Crystal manufacture date.
Pad 1 / Static sensitivity identifier (Δ),
Abbreviated P/N (4672),
Device date code (YW),
Serial number (nnnn).



Electrical

Nominal Frequency, Fo	12.688656 MHz
Supply Voltage, Vs	3.3 V ± 10%
Input Current	≤ 4.0 mA
Output:	
Type	HCMOS
Load	15 pF
Vol	≤ 0.1 * Vs
Voh	≥ 0.9 * Vs
Duty cycle @ 50%	45% to 55%
Rise time, 10% to 90%	≤ 8 ns
Fall time, 90% to 10%	≤ 8 ns
Frequency Stability	
Calibration Tolerance at 25°C	≤ ± 0.5 ppm
Temperature, -20°C to 55°C	≤ ± 0.2 ppm reference to $(F_{max}+F_{min})/2$
Supply Voltage, ± 10%	≤ ± 0.1 ppm reference to frequency at 3.3V
Load, ± 5pF	≤ ± 0.1 ppm reference to frequency at 15 pF
Allan Variance (tau=100ms)	≤ 1.0 ppb

Page 1 of 2

Figure 3: Reference Crystal Data Sheet - Class 2; Sheet 1 of 2

coverise

RAKON

Oscillator Specification: E4672LF(T)
Issue 3, 9th July 2008, LN4661

Designed for use in "Cospas-Sarsat" Emergency Beacon Applications

Medium term stability specified and measured according to C/S T.001 & T.007* (averaged over 18 measurements in 15 minute period, and following 15 minute power up period)

Mean Slope dF/dt	
Steady state conditions	≤ ± 0.7 ppb/min
During and 15 minutes after variable temperature conditions	≤ ± 1.7 ppb/min (dT/dt ≤ ± 5ºC / hour)
Residual dF from slope	≤ ± 2.0 ppb (dT/dt ≤ ± 5ºC / hour)

Test results shipped with each device, identified by date and serial number, retained for 10 years.

Reflow soldering	≤ ± 1.0 ppm
Ageing, first year	≤ ± 1.0 ppm
Ageing, 10 years	≤ ± 3.0 ppm
Tri-State	
Pad 8 open circuit or ≥ 0.6Vs	Output Enabled
Pad 8 ≤ 0.2Vs	Output High impedance

In Tri-state mode, the output stage is disabled but the oscillator and compensation circuit are still active (Current consumption 1mA typ.).

Phase Noise (typical values)	-90 dBc/Hz at 10 Hz
	-115 dBc/Hz at 100 Hz
	-127 dBc/Hz at 1 kHz
	-137 dBc/Hz at 10 kHz
	-143 dBc/Hz at ≥ 100 kHz

Environmental

Operating Temperature Range	-20 to +55°C
Storage Temperature Range	-55 to +125°C
Vibration	IEC 60068-2-6 Test Fc, 10-60Hz 1.5mm displacement, at 98.1 ms^{-2},30 minutes in each of three mutually perpendicular axes at 1 octave per minute
Shock	IEC 60068-2-27 Test Ea, 980ms^{-2} acceleration for 6ms duration, 3 shocks in each direction along three mutually perpendicular axes
Soldering	SMD product suitable for Convection Reflow soldering. Peak temperature 260°C. Maximum time above 220°C, 60 secs.
Solderability	MIL-STD-202, Method 208, Category 3
RoHS	Parts are fully compliant with the European Union directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment. Note these RoHS compliant parts are suitable for assembly using both Lead-free solders and Tin/Lead solders.
Marking	Laser Marked
Packaging	Parts ordered with suffix 'T' are supplied on Tape-and-Reel.

* COSPAS SARSAT 406MHz distress beacons specification C/S T.001 (Issue 3, Revision 8, NOV 2007) and C/S T.007 (Issue 4, Revision 2, NOV 2007)

Figure 4: Reference Crystal Data Sheet - Class 2; Sheet 2 of 2

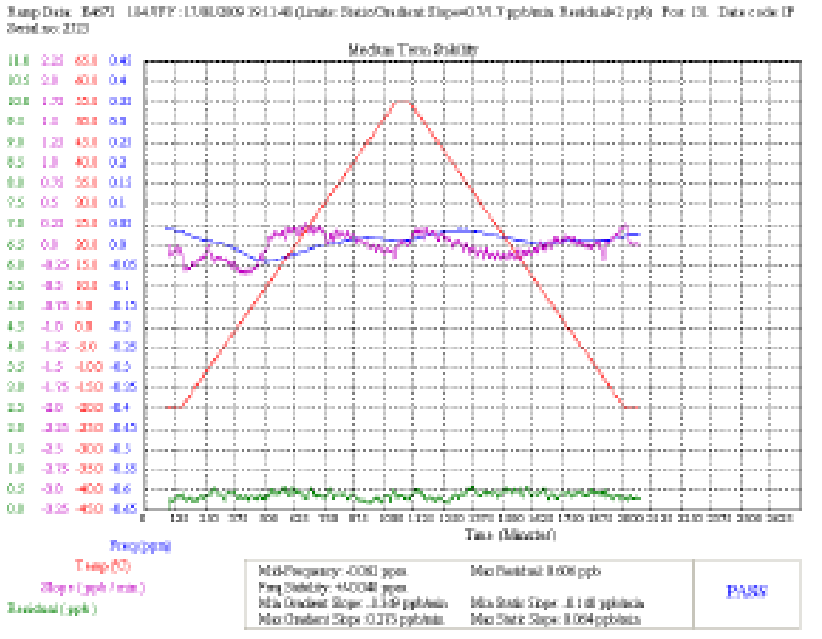


Figure 10: Frequency stability plot for crystal used E100G in Ser No. 0001200014i

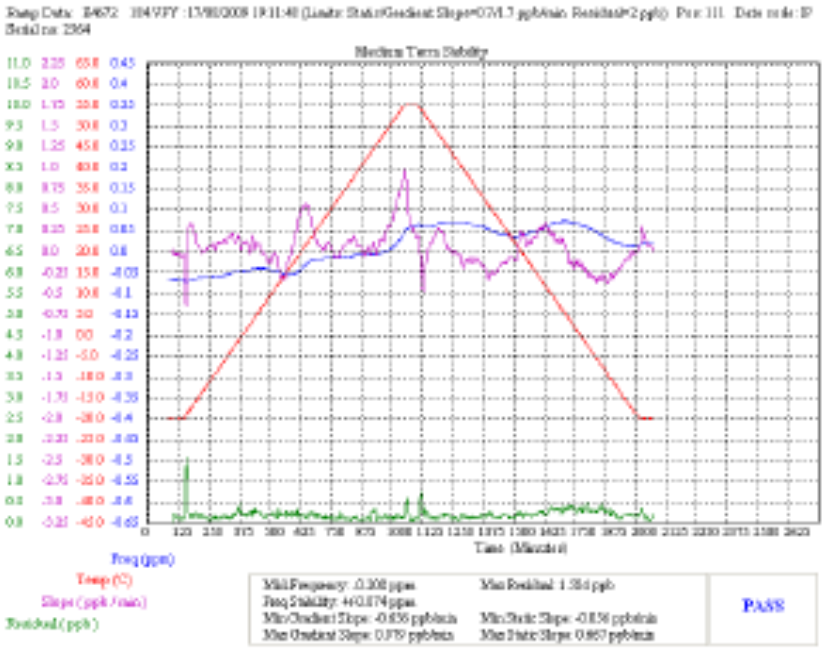


Figure 11: Frequency stability plot for crystal used in E100G Ser No. 0001200013i

9. DESCRIPTIONS TO DEMONSTRATE THAT THE DESIGN PROVIDES PROTECTION AGAINST CONTINUOUS TRANSMISSION

Section 5 j. i.) C/S T.007

coverise

T.007; 5.j Compliance statements

The following statements justify that the design of the SafeSea E100 series EPIRBs meets the following criteria

i. provides protection against continuous transmission (see section A.3.4),

The precise timing control of a 406MHz transmission is performed by the micro controller, IC2, which controls the application of PA supply voltage. To ensure that a transmission can last no longer than 45 seconds, due to a fault; when the PA supply voltage is switched on, C1 is charged through R19. This charging voltage is compared to the input threshold of IC7A, when the threshold has been exceeded the output of IC7B will change state from low to high. This signal will then turn on TR19 and TR25, thus disabling the synthesiser, IC4, and turning off the gate of TR1 respectively, therefore ending any further transmission.

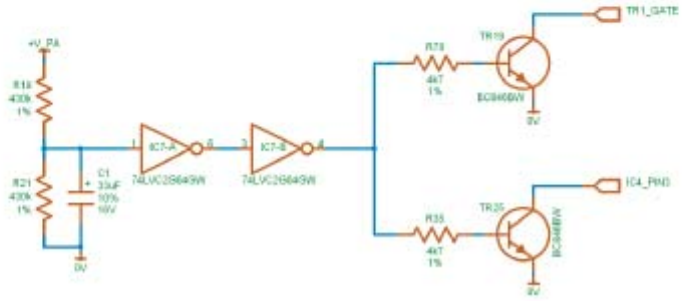


Figure 1: TX Timeout circuitry

10. DESCRIPTIONS TO DEMONSTRATE THAT THE DESIGN MEETS THE FREQUENCY STABILITY REQUIREMENTS OVER 5 YEARS

Section 5 j. ii.) C/S T.007

Sadler Road, Lincoln
LN6 3RS, United Kingdom

Tel.: + 44 (0) 1522 883528
Fax: + 44 (0) 1522 823535
E-mail: DavidW@Rakon.co.uk

Rakon UK Ltd.

TEST SUMMARY

REPORT No.:	**2008-029a**
Date:	10th July 2008
Product type:	Temperature Compensated Crystal Oscillator (TCXO)
Construction:	1) Surface Mount (7 x 5 mm) 2) "Pluto" ASIC
Generic Type:	CFPT-9000
RAKON UK Part No.:	E4672LF
Output Frequency:	12.688656 MHz
Number Tested:	20

TESTS PERFORMED

Test Performed: **5 year Stability Prediction**

Consisting of:

1) **Medium Term Stability Measurements at 0, 3 and 6 months**

Rakon UK Ltd.

Sadler Road, Lincoln
LN6 3RS, United Kingdom

Tel.: + 44 (0) 1522 883528
Fax: + 44 (0) 1522 823535
E-mail: DavidW@Rakon.co.uk

SUMMARY OF TEST RESULTS			
Test Required	Pass	Fail	Remarks
5 Year Prediction Residual (ppb)	20	0	Results attached
5 Year Prediction Minimum Negative Slope (ppb/min)	20	0	Results attached
5 Year Prediction Maximum Positive Slope (ppb/min)	20	0	Results attached
5 Year Prediction Aging Mid frequency (ppm)	20	0	Results attached

TESTS CONDUCTED

BY: *D Lowrie* DATE December 2007 to July 2008 APPROVED: *D R Woodall*

RAKON UK LTD

QUALIFICATION TEST RESULTS SHEET

Qualification Test: 5Year Stability Prediction

Ref. 2008-029a

Introduction:

In order to predict the stability of the devices over a five year period, 20 off E4672LF were tested, stored for 3 months at room temperature and then re-measured, the devices were then stored for a further 3 months and re-measured, this data was then used to generate the 5 year prediction.

Results:

Device E4672LF **Residual (ppb)**

Time (Days)	3	90	180		Prediction	
Serial Number	Start	3 months	6 months	Slope	Intercept	Prediction 5 years
1353	0.50	0.56	0.22	-0.09	0.57	0.27
1354	0.47	0.63	0.24	-0.05	0.53	0.36
1355	0.71	1.34	0.38	0.01	0.79	0.83
1362	0.65	0.62	0.40	-0.10	0.72	0.38
1363	0.74	0.84	0.56	-0.05	0.79	0.63
1364	0.57	1.14	0.28	0.01	0.64	0.68
1371	0.59	0.57	0.75	0.08	0.55	0.73
1372	0.78	0.80	0.19	-0.22	0.94	0.22
1373	1.04	0.88	0.66	-0.18	1.14	0.56
1380	2.04	1.63	1.24	-0.39	2.25	0.97
1381	0.86	0.80	0.36	-0.20	0.99	0.33
1389	0.51	0.77	0.19	-0.07	0.59	0.38
1390	0.67	0.83	0.40	-0.07	0.74	0.52
1393	0.49	0.66	0.27	-0.05	0.55	0.39
1394	0.46	0.65	0.21	-0.05	0.53	0.35
1402	0.68	0.94	0.23	-0.12	0.80	0.42
1403	1.19	0.99	0.72	-0.22	1.32	0.59
1412	1.01	0.78	1.21	0.03	0.96	1.05
1420	0.80	0.75	0.29	-0.21	0.94	0.26
1421	0.63	0.89	0.27	-0.08	0.72	0.46
Average	**0.77**	**0.85**	**0.45**	**-0.10**	**0.85**	**0.52**

RAKON UK

QUALIFICATION TEST RESULTS SHEET

Qualification Test: 5Year Stability Prediction Ref. 2008-029a

Device E4672LF	Min Negative Slope (ppb/min)					
Time (Days)	3	90	180		Prediction	
Serial Number	Start	3 months	6 months	Slope	Intercept	Prediction 5 years
1353	-0.26	-0.22	-0.22	0.02	-0.27	-0.19
1354	-0.26	-0.22	-0.31	-0.01	-0.25	-0.28
1355	-0.35	-0.44	-0.39	-0.03	-0.34	-0.45
1362	-0.40	-0.45	-0.42	-0.02	-0.39	-0.45
1363	-0.47	-0.47	-0.48	0.00	-0.47	-0.48
1364	-0.31	-0.35	-0.35	-0.02	-0.30	-0.38
1371	-0.53	-0.48	-0.48	0.03	-0.54	-0.45
1372	-0.20	-0.21	-0.25	-0.02	-0.19	-0.26
1373	-0.79	-0.86	-0.84	-0.03	-0.78	-0.89
1380	-1.64	-1.60	-1.54	0.05	-1.67	-1.51
1381	-0.40	-0.46	-0.36	0.00	-0.41	-0.40
1389	-0.27	-0.30	-0.21	0.02	-0.29	-0.23
1390	-0.42	-0.40	-0.39	0.02	-0.43	-0.38
1393	-0.45	-0.48	-0.49	-0.02	-0.44	-0.51
1394	-0.24	-0.24	-0.26	-0.01	-0.23	-0.26
1402	-0.24	-0.27	-0.23	0.00	-0.24	-0.25
1403	-0.90	-0.77	-0.72	0.10	-0.95	-0.63
1412	-0.92	-0.76	-0.96	0.02	-0.91	-0.85
1420	-0.28	-0.27	-0.37	-0.03	-0.26	-0.36
1421	-0.24	-0.30	-0.26	-0.02	-0.23	-0.30
Average	**-0.48**	**-0.48**	**-0.48**	**0.00**	**-0.48**	**-0.48**

RAKON UK

QUALIFICATION TEST RESULTS SHEET

Qualification Test: 5Year Stability Prediction Ref. 2008-029a

Device E4672LF	Max Positive Slope (ppb/min)					
Time (Days)	3	90	180		Prediction	
Serial Number	Start	3 months	6 months	Slope	Intercept	prediction 5 years
1353	0.23	0.21	0.20	-0.02	0.24	0.19
1354	0.18	0.16	0.41	0.08	0.12	0.39
1355	0.44	0.54	0.48	0.04	0.43	0.55
1362	0.40	0.41	0.45	0.02	0.39	0.46
1363	0.29	0.33	0.27	0.00	0.30	0.30
1364	0.26	0.31	0.28	0.02	0.25	0.31
1371	0.43	0.47	0.46	0.02	0.42	0.49
1372	0.23	0.23	0.26	0.01	0.22	0.26
1373	0.89	0.84	0.79	-0.05	0.92	0.76
1380	1.86	1.76	1.64	-0.11	1.92	1.57
1381	0.37	0.38	0.37	0.00	0.37	0.38
1389	0.21	0.20	0.17	-0.02	0.22	0.16
1390	0.55	0.50	0.54	-0.01	0.55	0.51
1393	0.47	0.48	0.55	0.03	0.45	0.56
1394	0.20	0.22	0.25	0.02	0.19	0.26
1402	0.26	0.26	0.23	-0.01	0.27	0.23
1403	0.44	0.50	0.47	0.02	0.43	0.51
1412	0.71	0.74	1.13	0.17	0.60	1.14
1420	0.29	0.23	0.36	0.01	0.27	0.32
1421	0.32	0.34	0.31	0.00	0.32	0.32
Average	**0.45**	**0.46**	**0.48**	**0.01**	**0.44**	**0.48**

RAKON UK LTD

QUALIFICATION TEST RESULTS SHEET

Qualification Test: 5Year Stability Prediction Ref. 2008-029a

Device E4672LF	Aging Mid Frequency ppm					
Time (Days)	3	90	180		Prediction	
Serial Number	Start	3 months	6 months	Slope	Intercept	prediction 5 years
1353	-0.09	-0.10	-0.13	-0.02	-0.08	-0.14
1354	-0.08	-0.16	-0.34	-0.12	-0.01	-0.39
1355	-0.08	-0.14	-0.21	-0.06	-0.05	-0.25
1362	-0.09	-0.14	-0.17	-0.04	-0.07	-0.20
1363	-0.08	-0.10	-0.13	-0.02	-0.07	-0.14
1364	-0.07	-0.14	-0.20	-0.06	-0.04	-0.25
1371	-0.01	-0.10	-0.16	-0.08	0.03	-0.22
1372	-0.13	-0.22	-0.25	-0.07	-0.10	-0.31
1373	-0.08	-0.12	-0.17	-0.04	-0.06	-0.20
1380	-0.13	-0.16	-0.17	-0.02	-0.12	-0.19
1381	-0.05	-0.10	-0.15	-0.05	-0.02	-0.18
1389	-0.05	-0.09	-0.11	-0.03	-0.03	-0.14
1390	-0.10	-0.15	-0.19	-0.05	-0.08	-0.22
1393	-0.10	-0.15	-0.21	-0.05	-0.07	-0.24
1394	-0.07	-0.09	-0.14	-0.03	-0.05	-0.15
1402	-0.10	-0.14	-0.18	-0.04	-0.08	-0.21
1403	-0.16	-0.20	-0.24	-0.04	-0.14	-0.27
1412	-0.03	-0.06	-0.19	-0.07	0.01	-0.21
1420	-0.05	-0.12	-0.25	-0.09	0.00	-0.30
1421	-0.14	-0.21	-0.24	-0.05	-0.11	-0.29
Average	**-0.08**	**-0.13**	**-0.19**	**-0.05**	**-0.06**	**-0.22**

11. DESCRIPTIONS TO DEMONSTRATE THAT THE DESIGN PROVIDES PROTECTION FROM REPETITIVE SELF-TEST MODE TRANSMISSIONS

Section 5 j iii.) C/S T.007

coverise

T.007; 5.j Compliance statements

iii. provides protection from repetitive self-test mode transmissions

a. Beacon Self Test

The self-test function of the EPIRB is implemented in the following sequence of in-line steps; there is no looping or repetition of any step:

- The 121.5MHz homing beacon is started, the modulation is monitored and after three sweeps of the modulation frequency the beacon is turned off.
- The 406MHz message transmitter is activated and monitored; after one test message has been transmitted the transmitter is turned off.
- The LDC light is activated and after one flash it is turned off.
- The indicator LEDs are flashed to indicate pass / fail status.
- The EPIRB then enters a shutdown mode in which it switches off power from the battery. If the test switch is still being held at this time, the red and green LEDs will flash alternately until the switch is released – no other operation can be performed while in this mode, in other words it is not possible to start another self-test if the test switch is held down.

Throughout the self-test procedure the switch is monitored by sampling its condition every 10 milliseconds by interrupt under the control of a hardware timer. The operation of the hardware timer and the operational software are continually monitored for integrity by the use of a hardware watchdog timer.

In summary, it is not possible to perform repeated self-tests unless by deliberate action on the part of the user.

b. GNSS Receiver Self Test

The GNSS self-test is limited to checking operation of the internal GPS receiver only; there are no test transmissions of either 121.5MHz or 406MHz systems.

The test involves turning on the internal GPS receiver and waiting for a position fix to be obtained, once this condition is met then the EPIRB will report the status by use of the LEDs and then switch off. At the time that the GPS receiver is turned on a timer is also started, this timer is implemented by counting interrupts generated from a hardware timer which in turn is monitored by the system watchdog. This timer will run for 5 minutes or be stopped by a position fix being obtained, whichever occurs first. If the timer completes its run then the EPIRB will report a failure by the use of the LEDs and turn off. If the test switch is held down at the end of this test then the EPIRB will enter power down mode indicated by alternate flashing of the red and green LEDs until the switch is released. It is not possible to repeat the test or perform any other function if the switch is held down.

In summary the GNSS self-test mode is limited to a maximum duration of 5 minutes and cannot be repeated unless a deliberate action is taken to do so.

12. A TECHNICAL DESCRIPTION THAT CONFIRMS THE NOMINAL OUTPUT IMPEDANCE OF THE BEACON POWER AMPLIFIER IS 50 OHMS AND THE BEACON ANTENNA INPUT IMPEDANCE IS 50 OHMS

Section 5 k. C/S T.007

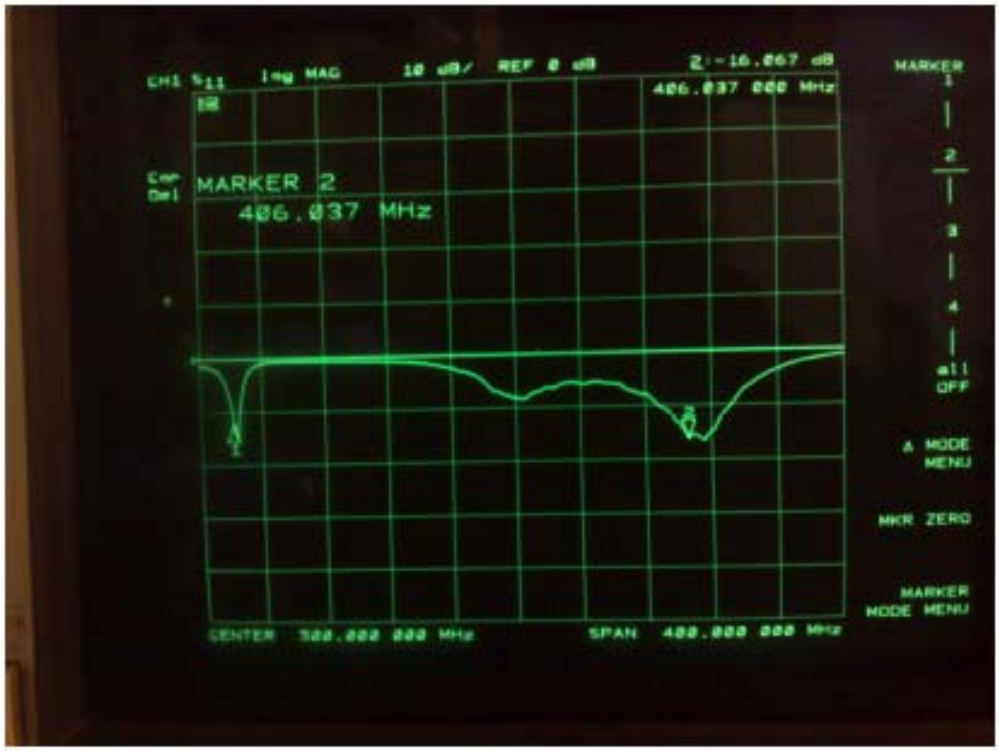
coverise

T.007: 5.k Antenna Matching Analysis

The output impedance of the 406MHz power amplifier on the units with the test connector is nominally 50Ohms. The antenna VSWR has been established by measurement.

The antenna return loss was measured with a HP 8753B Network Analyser, with the antenna mounted on the ground plane.

The plot of the return loss is shown below.



The measured return loss at 406.037MHz is indicated as -16.067dB

This gives a calculated VSWR of 1.37:1.

13. THE BEACON QUALITY ASSURANCE PLAN

section 5 m. C/S T.007

ANNEX L

BEACON QUALITY ASSURANCE PLAN

We, manufacturer of Cospas-Sarsat 406 MHz beacons (Manufacturer name and address)
Coverise Limited, Unit 5, Ocivan Way _____
Margate, CT9 4NN, United Kingdom _____

confirm that ALL PRODUCTION UNITS of the following beacon model(s),
SafeSea E100 (Manual and Auto release), Software Issue 00.00.22 _____
(model, hardware part number, firmware part number, software version or part number)
SafeSea E100G (Manual or Auto Release), Software Issue 00.00.22 _____

_____

will meet the Cospas-Sarsat specification and technical requirements in a similar manner to the units subjected for type approval testing. To this effect all production units will be subjected to following tests at ambient temperature:

- Digital message
- Bit rate
- Rise and fall times of the modulation waveform
- Modulation Index (positive/negative)
- Output power
- Frequency stability (short, medium)*

Note*: Beacon manufacturer shall provide technical data on the beacon frequency generation to demonstrate that the frequency stability tests at ambient temperature are sufficient for ensuring that each production beacon will exhibit frequency stability performance similar to the beacon submitted for type approval over the complete operating temperature range. If such assurance of adequate performance over the complete operating temperature range cannot be deduced from the technical data provided and the frequency stability test results at ambient temperature, a thermal gradient test shall be performed on all production units.

- Other tests:

GNSS Receiver test for E100G only _____

_____

_____

_____

_____

We confirm that the above tests will be performed as appropriate to ensure that the complete beacon satisfies Cospas-Sarsat requirements, as demonstrated by the test unit submitted for type approval.

We agree to keep the test result sheet of every production beacon for inspection by Cospas-Sarsat, if required, for a minimum of 10 years.

We confirm that Cospas-Sarsat representative(s) have the right to visit our premises to witness the production and testing process of the above-mentioned beacons. We understand that the cost related to the visit is to be borne by Cospas-Sarsat.

We also accept that, upon official notification of Cospas-Sarsat, we may be required to resubmit a unit of the above beacon model selected by Cospas-Sarsat for the testing of parameters chosen at Cospas-Sarsat discretion at a Cospas-Sarsat accepted test facility selected by the Cospas-Sarsat. We understand that the cost of the testing shall be borne by Cospas-Sarsat.

We understand that the Cospas-Sarsat Type Approval Certificate is subject to revocation should the beacon type for which it was issued, or its modifications, cease to meet the Cospas-Sarsat specifications, or Cospas-Sarsat has determined that this quality assurance plan is not implemented in a satisfactory manner.

Dated: 17/12/2009..... Signed: David Sheekey, Product and Approvals Manager.....
(Name, Position and Signature of Beacon Manufacturer Representative)

14. DESCRIPTION OF THE GNSS RECEIVER OPERATION CYCLE AND ITS PHASES, INCLUDING DURATION AND AVERAGE BATTERY CURRENT MEASURED FOR EACH PHASE

section 5 n C/S T.001

coverise

T.007: 5.n GNSS Operation

The SafeSea E100G series EPIRBs use a UBlox NEO-5Q GPS module to determine its latitude and longitude position.

Every time EPIRB is switched from off to on the GPS is powered up in a "Maximum Performance" mode with a cold start to acquire a position.

Once a position has been acquired by the receiver to an accuracy of less than 100m then the position is stored for transmission and the GPS module is turned off to conserve battery capacity.

After 20 minutes the GPS module is turned on again to update the position, after a successful position has been received the GPS mode is switched to "Eco" to conserve power.

If the GPS fails to acquire a position during an acquisition period, the next time the GPS is powered on it is powered on in the Maximum Performance mode.

The maximum time the EPIRB will allow the GPS to search for a valid position is limited to 10 minutes in the first two acquire periods after EPIRB switch on and 5 minutes thereafter.

The GPS position is considered valid if it was obtain less than four hours from the current time. After the position is four hours old a new GPS position must be obtained or the EPIRB will revert to a non GPS EPIRB until a valid GPS position is received.

If an EPIRB has been switched on for a long period of time and not received a valid GPS position, it is highly likely that a fault condition has occurred and further attempts at acquiring a position would only reduce battery capacity without gaining a position fix. This point is considered reached if unit on time is 45 hours at -25C or colder and 73 hours for all other temperatures when no valid position has been received. From this point forward the EPIRB will no longer try to gain a GPS position, thus conserving battery capacity for use as a non GPS EPIRB extending the operation time to aid rescue.

For current consumption figures see sections c. and d.

15. DECLARATION OF ALL MANUALLY SELECTABLE OPERATION MODES

Section 5 o. C/S T.007

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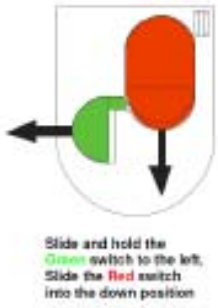
T.0007: 5.o List of operation modes

The SafeSea E100 series EPIRBs have the following operational modes.

1. Manual Activation
   a. To activate the EPIRB manually, the break-off cover over the switches must be removed. The Green actuator is slid to the left to unlock the Red actuator, which can then be slid down to activate the beacon. Release the Green actuator to lock the Red actuator in the activate position.



   b. On activation the low duty cycle LED will commence flashing straight away, then after the random (~50 second) interval, the 406MHz transmission will commence. Depending on configuration of the beacon, the 121.5MHz homing beacon either commences transmission immediately or after the first 406MHz transmission.
2. Water Activation
   a. When the EPIRB is immersed in water, in its normal floating position, the EPIRB will automatically activate between 10 and 15 seconds. The water contacts are monitored for 10 seconds after first detection to reduce the risk of accidental activation. Note: the water contacts are concealed behind the switch mechanism cover and lanyard reel to prevent inadvertent operation.
   b. On activation the sequence of events follows the same order as for manual activation.

16. NAVIGATION SYSTEM TEST RESULTS WITH TEST SCRIPTS WHICH REPLICATE THE LOCATION INFORMATION CONDUCTED BY MANUFACTURER

section A.3.8.7 C/S T.007-2009 with footnote 1
(used Annex D and Appendix C to Annex F
of document T.007 Issue 4 Rev.2 (November 2007)
for this test)

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T.007: 5.b.III NAVIGATION SYSTEM TEST RESULTS

The following data demonstrating the results of the navigation data beacon coding software are provided by Coverise Ltd. All tests were performed by Adrian Mason.

Table F-C.1 of C/S T.007

Position Data Encoding Results User-Location Protocol

Script Reference (See Table D.1)	Value of Encoded Location Bits Transmitted by Beacon (Hexadecimal)	Confirmation that BCH Correct (4)
1	Bits 108 – 132 = FE0FF0	4
2	Bits 108 – 132 = 23011 Number of seconds after providing navigation data that beacon transmitted the above encoded location information: 34.75	4
3	Bits 108 – 132 = 6D052	4

Table F-C.2 of C/S T.007

Position Data encoding Results Standard Location Protocol

Script Reference (See Table D.2)	Value of Encoded Location Bits Transmitted by Beacon (Hexadecimal)	Confirmation that BCH Correct (4)
1	Bits 65 – 85 = FFBFF Bits 113 – 132 = 83E0F	4
2	Bits 65 – 85 = 2404 Bits 113 – 132 = 8E227 Number of seconds after providing navigation data that beacon transmitted the above encoded location information: 30.55	4
3	Bits 65 – 85 = 2404 Bits 113 – 132 = F8227	4
4	Bits 65 – 85 = 3404 Bits 113 – 132 = 88227	4
5	Bits 65 – 85 = 3404 Bits 113 – 132 = 74627	4
6	Bits 65 – 85 = 2404 Bits 113 – 132 = 8227	4
7	Bits 65 – 85 = 2404 Bits 113 – 132 = 83D7	4
8	Bits 65 – 85 = 2406 Bits 113 – 132 = 8227	4
9	Bits 65 – 85 = 2406 Bits 113 – 132 = 81B8	4
10	Bits 65 – 85 = 2402 Bits 113 – 132 = 8206	4

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Table F-C.3 of C/S T.007

Position Data encoding Results National Location Protocol

Script Reference (See Table D.3)	Value of Encoded Location Bits Transmitted by Beacon (Hexadecimal)	Confirmation that BCH Correct (4)
1	Bits 59 – 85 = 3F81FE0 Bits 113 – 126 = 27CF	4
2	Bits 59 – 85 = A8A0C2 Bits 113 – 126 = 2489 Number of seconds after providing navigation data that beacon transmitted the above encoded location information: 23.06	4
3	Bits 59 – 85 = A8A0C2 Bits 113 – 126 = 3F09	4
4	Bits 59 – 85 = D8A0C2 Bits 113 – 126 = 2189	4
5	Bits 59 – 85 = D8A0C2 Bits 113 – 126 = B09	4
6	Bits 59 – 85 = C8B67D Bits 113 – 126 = 749	4
7	Bits 59 – 85 = C8967D Bits 113 – 126 = 77E	4
8	Bits 59 – 85 = C8967C Bits 113 – 126 = 702	4
9	Bits 59 – 85 = C8967C Bits 113 – 126 = 77E	4
10	Bits 59 – 85 = C8B67D Bits 113 – 126 = 749	4

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Beacon Tester Results

The results from the beacon tester while performing the preceding tests are stored in the following files:

1. User Location Protocol (User Location Protocol with MMSI)

Script 1	Burst-2741
Script 2	Burst-2742
Script 3	Burst-2743

2. Standard Location Protocol (Standard Location Protocol with MMSI)

Script 1	Burst-2744
Script 2	Burst-2745
Script 3	Burst-2746
Script 4	Burst-2747
Script 5	Burst-2748
Script 6	Burst-2749
Script 7	Burst-2750
Script 8	Burst-2751
Script 9	Burst-2752
Script 10	Burst-2753

3. National Location Protocol

Script 1	Burst-2754
Script 2	Burst-2755
Script 3	Burst-2756
Script 4	Burst-2757
Script 5	Burst-2758
Script 6	Burst-2759
Script 7	Burst-2760 **
Script 8	Burst-2761
Script 9	Burst-2762
Script 10	Burst-2763

** The longitude reported in this file is incorrect due to a bug in the beacon tester software – the transmitted message is correct.