

Beacon marketing brochure

T.007: 5.f Brochure

The Ocean Signal PLB1 brochures images follow. The brochure is an A6 fan fold document with six sides. The pages are presented in the order they are intended to be read.



Communication and Safety at Sea



Waterproof to 15m



Easily deployed antenna



Flotation lanyard included*

In an emergency **rescueME PLB1** provides 3 methods of communicating your location ensuring maximum chance of survival.



Link via satellite to Emergency Services



Homing Beacon to aid final location by Search and Rescue craft



High intensity (1 candela) strobe

Wherever you are at sea or on land, the **rescueME PLB1** provides the reassurance that emergency services can be alerted by the press of a button.

rescueME PLB1 works with the only officially recognised worldwide dedicated search and rescue satellite network (operated by Cospas Sarsat). As this is funded by governments there are NO CHARGES to use this service.

When activated, the **rescueME PLB1** transmits your position and your unique ID to a Rescue Coordination Centre via satellite link. Rescue services are promptly notified of your emergency and regularly advised of your current location.

To assist with search and rescue, a homing signal is transmitted on 121.5MHz, which is received by equipment fitted to both sea and airborne rescue craft.

* Not intended to operate with the PLB floating in water

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Features



rescueME PLB1 can be easily stowed in your jacket or fitted onto a belt taking up minimal space and ensuring it is easily accessible.

Antenna deployment could not be easier, with a gentle pull the aerial is released.



www.oceansignal.com

Features and Specifications



One handed operation



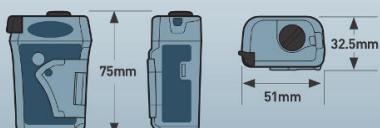
moulded lens enhances light output (one candela)

The **rescueME PLB1** can be operated with a single hand in even the most challenging situations. A simple spring loaded flap covers the activation button preventing inadvertent use. The integrated strobe light ensures maximum visibility with an incredible 1 candela output.

Specifications

Satellite transmission	406.040MHz, 5Watts
Homing transmission	121.5MHz, 50mW nominal
Operation life	>24hrs at -20°C (-4°F)
Operating temperature range	-20°C to +55°C (-4°F to +131°F)
Weight	116g (4.1oz)
Standards	Cospas Sarsat T.001/T.007, ETSI EN302 152, RTCM SC11010, NSS-PLB11, IC RSS287

PLB1 dimensions



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rescueME PLB1 can be used on land as well as at sea.

Whilst every effort has been made to ensure the information in this brochure is accurate, prints and specifications may be changed without notice.



ocean SIGNAL

Rev 01

The technical data sheet for the battery cells used in the beacon and the electric diagram of the beacon's battery pack

T.007: 5.g Cell and Battery Data

The data sheet for the cells used in the rescueME PLB1 and the configuration drawing are attached.

The battery consists of three Energizer Lithium 123 cells connected in series

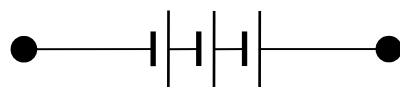


Figure 1: Schematic of rescueME PLB1 Battery Pack

PRODUCT DATASHEET

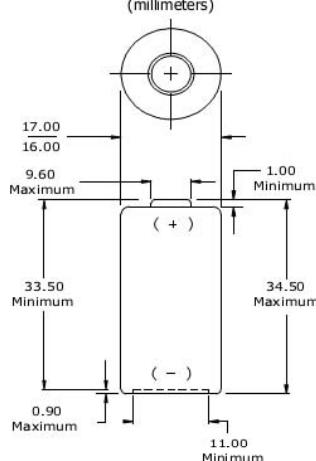
Energizer

+ 44 (0) 208 920 2306
www.energizer.eu

ENERGIZER 123



Industry Standard Dimensions (millimeters)



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

Simulated Application Tests

Typical Use Performance

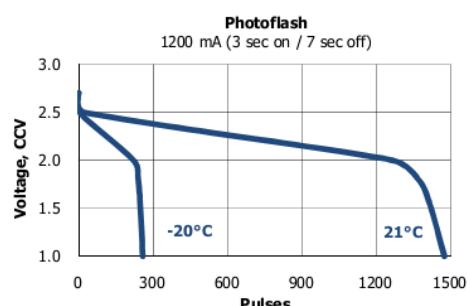
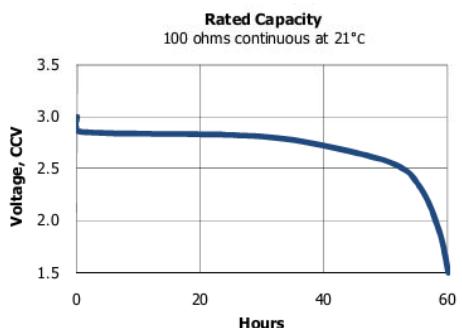
Type (time)	Drain (mA)	Load (ohms)	Cutoff Voltage		
			2.0V (21°C) (hours)	1.8V (21°C) (pulses)	1.55V (21°C) (pulses)
Capacity (continuous)	--	100	58	---	---
Photoflash (3 / 27 sec)	900	--	--	--	2000
Photoflash (3 / 7 sec)	1200	--	--	1370	---
Photoflash (3 / 7 sec)	1800	--	--	860	---

Specifications

Classification: "Lithium"
Chemical System: Lithium / Manganese Dioxide (Li/MnO₂)
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 uA
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

Photo

Typical Discharge Characteristics



Important Notice

This data sheet contains typical information specific to products manufactured at the time of its publication.
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Figure 2: Energizer 123 Photo Lithium Cell Data Sheet used in rescueME PLB1.

PRODUCT TECHNICAL SUPPORT


Date: May 7, 2009

Subject: Battery Shelf Life, Temperature Storage and Date Coding

The following will explain the above mentioned subject matter as it relates to Energizer / Eveready products you purchase from us. The percentage of capacity retained will vary depending on the chemical system and storage conditions. Typically Lithium batteries will retain approximately 90% capacity for the number of years specified. All other chemistries will retain approximately 80-85% capacity.

Battery Shelf Life (at 70°F):

<i>Chemical System</i>	<i>Cell Size(s)</i>	<i>Shelf Life</i>
Energizer Alkaline (Hi-Tech):	AA, AAA 9 volt	7 Years 5 Years
Energizer Alkaline (Ultra +):	AA, AAA, C, D, & 6 volt 9 volt	7 Years 5 Years
Energizer Alkaline (Classic):	AA, AAA, C, & D 9 volt	7 Years 5 Years
Heavy – Duty:	AA, AAA, C, D	3 Years
Carbon Zinc (multicell batteries) :	All specialty types (9V, HS14196, HS6570, 246, 276, 411, etc.)	1.5 Years
Lithium (Ultimate):	AA, AAA	15 Years
Lithium Photo:	All sizes	10 Years
Lithium Coin Cells:	All sizes	10 Years
Nickel Metal Hydride:	AA, AAA, C, D & 9 volt	3 Years
Hearing Aid (Zinc Air):	All sizes	4 Years
Watch Batteries:	All sizes	7 Years

Note: The same shelf life period would apply to the appropriate battery chemical system packed with flashlights and lanterns.

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Figure 3: Additional Cell Data, showing manufacturer declared shelf life and capacity at end of shelf life.

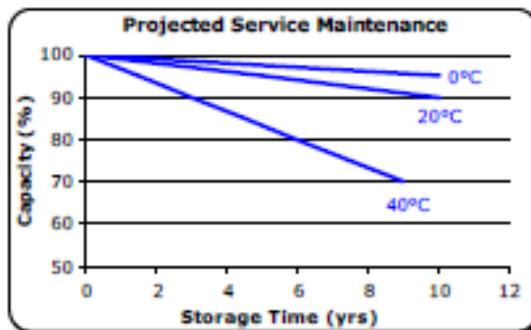
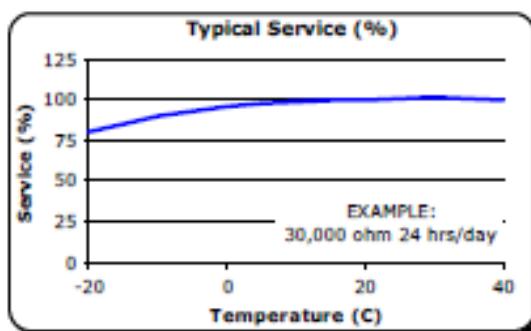

 Energizer

Typical Temperature Effects

Energizer / Eveready Batteries

Battery systems vary in their ability to provide service and shelf life at various temperatures.
Make sure you choose the right battery for the right job!

Lithium Manganese Dioxide



This reference manual contains general information on all Energizer/Eveready batteries in production at the time of preparation of the manual. Since the characteristics of individual batteries are sometimes modified, persons and businesses that are considering the use of a particular battery should contact the nearest Energizer Sales Office for current information. None of the information in the manual constitutes a representation or warranty by Eveready Battery Company, Inc. concerning the specific performance or characteristics of any of the batteries or devices.

Figure 4: Additional Cell Data, showing manufacturer declared self discharge over time (Projected Service maintenance) at various temperatures. Data Taken from Typical Temperature Effects Energizer / Eveready Batteries Reference Manual.

From the above information we can see that over a 10 year period the discharge is 10% of the cell original capacity. The industry standard equation for self discharge is

$$\text{Cell Capacity} = (1 - \text{self discharge_per_year})^{\text{Number of years}}$$

Where self discharge_per_year and cell capacity is a percentage

From this we can calculate the percentage loss of capacity per year as

$$1 - (0.90)^{1/10} = 1.0\%$$

We can then calculate the capacity loss per year according to the following table

Years	% Capacity of Original Cell Capacity
0	100%
1	99%
2	98%
4	95.9%
5	94.9%
8	91.9%
10	90%
12	88.1%
15	85.4%

A copy of the beacon label

T.007: 5.h Beacon Labelling

rescueME PLB Labels



Figure 1: PLB1 Front Label with flap closed and removed

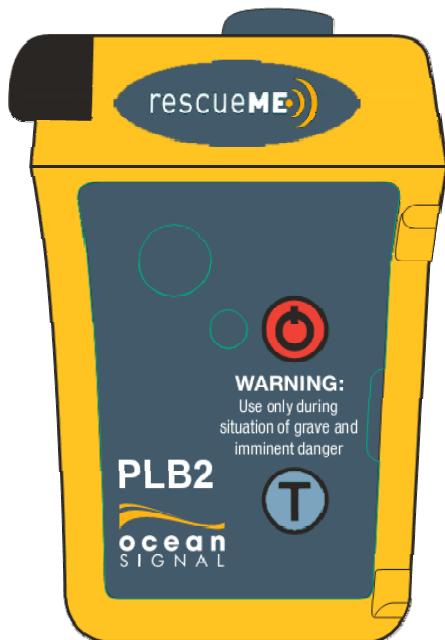


Figure 2: PLB2 Front label: similar to PLB1, but with product code changed and GPS warning removed



Figure 3: PLB1/PLB2 Approvals information under flap



Figure 4: PLB1/PLB2 Operating instructions

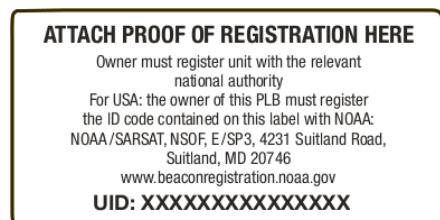


Figure 5: PLB1/PLB2 UIN label and USA registration information label

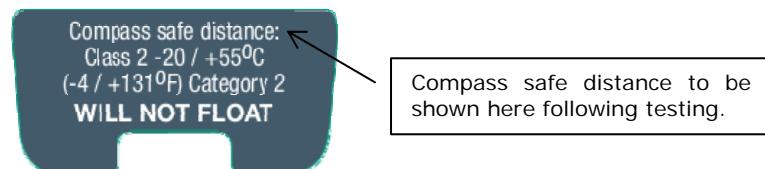


Figure 6: PLB1/PLB2 Operating conditions label



Figure 7: PLB1/PLB2 Battery expiry date (on top of unit)

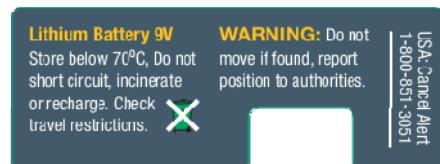


Figure 8: PLB1/PLB2 Warning label

Technical data sheet of the reference oscillator

T.007: 5.i TCXO Data Sheets

The reference oscillator crystal for the 406MHz transmitter in the rescueME PLB1 and PLB2 is made by RAKON Ltd. The following data sheets and sample data are attached.

Figure 1: Reference Crystal Data Sheet - Sheet 1 of 2	2
Figure 2: Reference Crystal Data Sheet - Sheet 2 of 2	3
Figure 3: Frequency stability plot for crystal used in rescueME PLB1 – Unit 1 Rakon Serial N°LS1679 (PCB5).....	4
Figure 4: Frequency stability plot for crystal used in rescueME PLB2 – Unit 4 Rakon Serial N°LS1626 (PCB6 – non-GPS)	4

rakon

Oscillator Specification: E5344LF(T)
 Issue 1, 24th February 2010

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

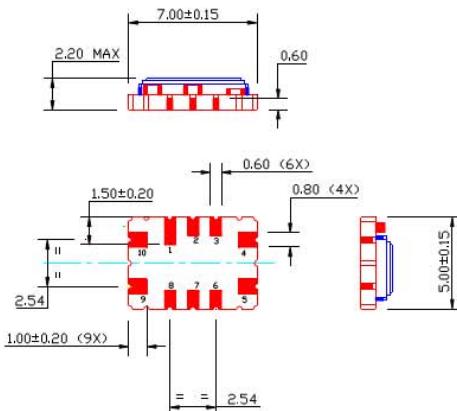
Outline in mm

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

- Manufacturers ID (R)
- Manufacturing identifier (X XX)
- Pad 1 / Static sensitivity identifier (Δ)
- Abbreviated P/N (5344)
- Device date code (YW)
- Serial number (nnnn)

R X XX
 Δ 5344YWnnnn

Electrical

Nominal Frequency, F ₀	12.688750 MHz
Supply Voltage, V _s	3.3 V ± 10%
Input Current	≤ 4.0 mA
Output:	
Type	HCMOS
Load	15 pF
Vol	≤ 0.1 * V _s
Voh	≥ 0.9 * V _s
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

Figure 1: Reference Crystal Data Sheet - Sheet 1 of 2



Oscillator Specification: E5344LF(T)
Issue 1, 24th February 2010

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	$\leq \pm 0.7 \text{ ppb/min}$
Steady state conditions	$\leq \pm 0.7 \text{ ppb/min}$
During and 15 minutes after variable temperature conditions	$\leq \pm 1.7 \text{ ppb/min (dT/dt} \leq \pm 5^\circ\text{C / hour)}$ $\leq \pm 2.0 \text{ ppb (dT/dt} \leq \pm 5^\circ\text{C / hour)}$
Residual dF from slope	
Test results shipped with each device, identified by date and serial number, retained for 10 years.	
Reflow soldering	$\leq \pm 1.0 \text{ ppm}$
Ageing, first year	$\leq \pm 1.0 \text{ ppm}$
Ageing, 10 years	$\leq \pm 3.0 \text{ ppm}$
Tri-State	
Pad 8 open circuit or $\geq 0.6\text{Vs}$	Output Enabled
Pad 8 $\leq 0.2\text{Vs}$	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 $+55^\circ\text{C}$
Storage Temperature Range	-55 to $+125^\circ\text{C}$
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 9, OCT 2008) and C/S T.007 (Issue 4, Revision 3, OCT 2008)

Figure 2: Reference Crystal Data Sheet - Sheet 2 of 2

Ramp Data: E5344 2494.VFY : 23/09/2012 23:42:34 (Limits: Static/Gradient Slope=0.7/1.7 ppb/min Residual=2 ppb) Pos: 170 Date code: LS
 Serial no: 1679

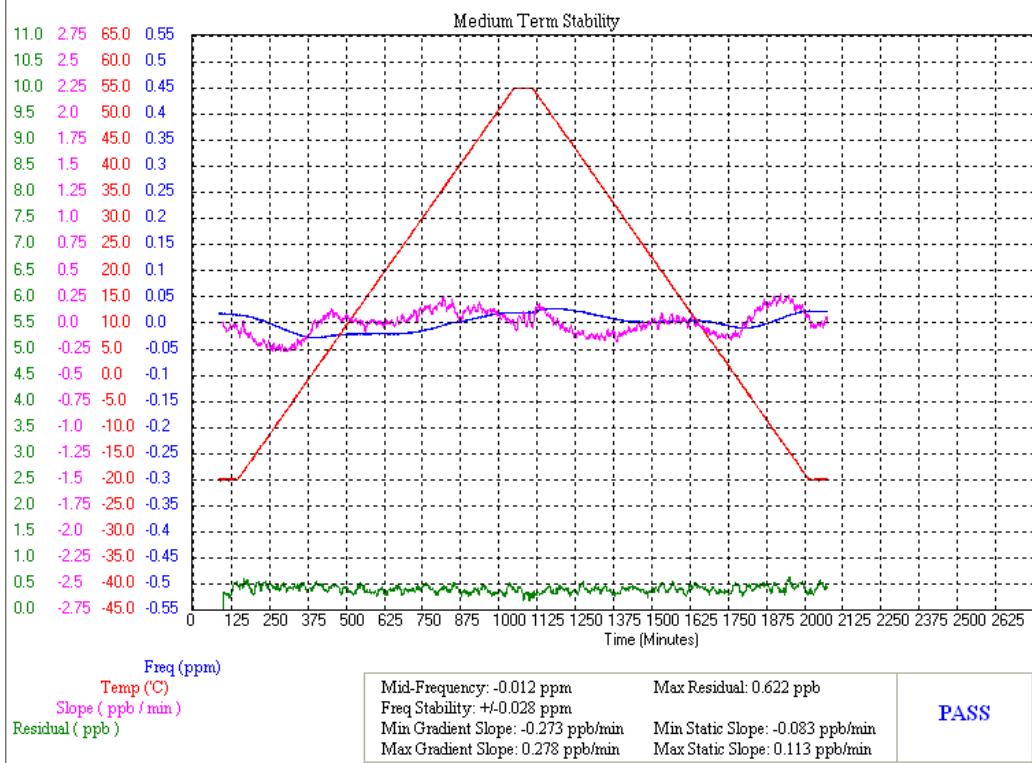


Figure 3: Frequency stability plot for crystal used in rescueME PLB1 – Unit 1 Rakon Serial N°LS1679 (PCB5)

Ramp Data: E5344 2494.VFY : 23/09/2012 23:42:34 (Limits: Static/Gradient Slope=0.7/1.7 ppb/min Residual=2 ppb) Pos: 117 Date code: LS
 Serial no: 1626

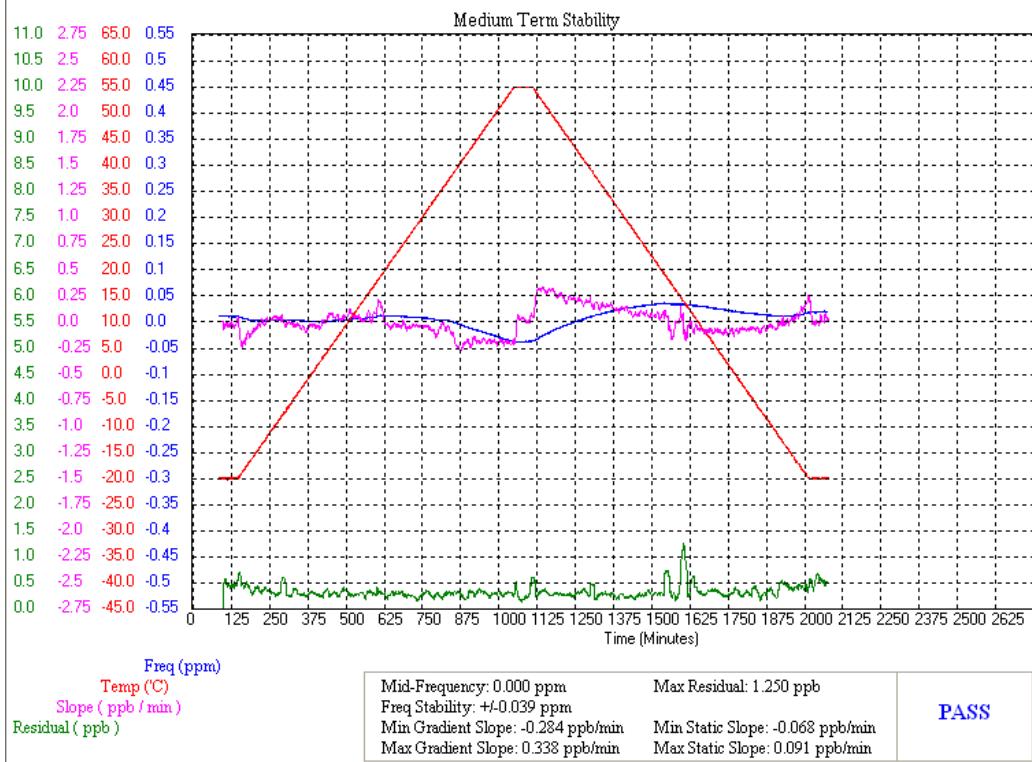


Figure 4: Frequency stability plot for crystal used in rescueME PLB2 – Unit 4 Rakon Serial N°LS1626 (PCB6 – non-GPS)

Compliance statements

T.007; 5.j Compliance statements

The following statements justify that the design of the rescueME PLB1 and rescueME PLB2 meets the following criteria.

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

406MHz Transmit Time Out

The precise timing control of a 406MHz transmission is performed by the micro controller, IC4, 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, C42 is charged through R25. The time constant of this network is much shorter than the 45seconds limit. This charging voltage is compared to the input threshold of TR3A. When the threshold has been exceeded TR3A switches on, turning TR3B off, this in turn switches TR4 off thus removing the supply voltage from the PA and ending any further transmission.

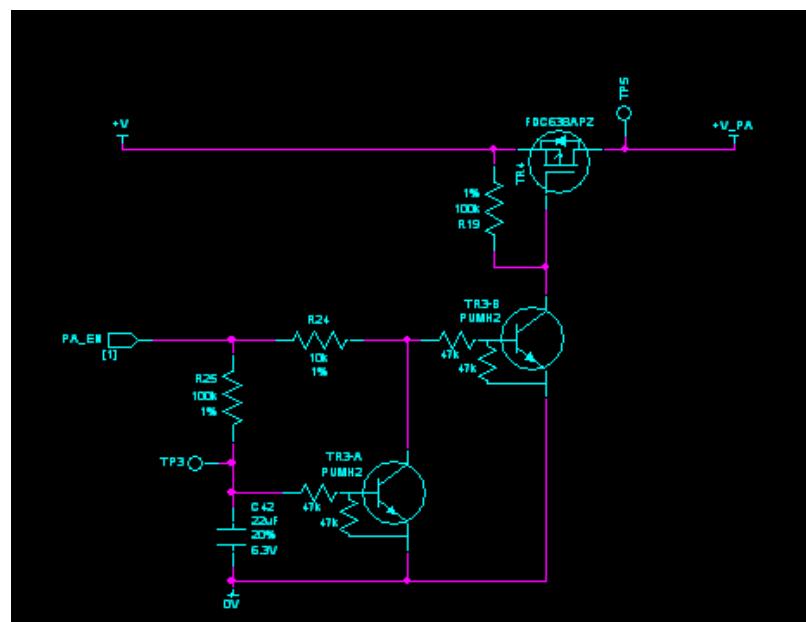


Figure 1: TX Timeout circuitry

ii. meets the frequency stability requirements over 5 years (see section A.3.5),

Statements from Rakon Limited providing evidence of both five and ten year stability for the TCXO can be found in Annex 1 of this section.

iii. provides protection from repetitive self-test mode transmissions

a. Beacon Self Test

The self-test function of the PLB 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 strobe LED light is activated and after one flash it is turned off.
- The indicator LEDs are flashed to indicate pass / fail status.
- The PLB then enters a shutdown mode in which it switches off power from the battery to all parts of the circuit except the micro. It is not possible to start another self-test if the test switch is held down.

To prevent inadvertent lockup of the test mode, during the self-test procedure the switch is continuously 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 to re-initiate the test.

b. GNSS Receiver Self Test (rescueME PLB1 Only)

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 PLB 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 PLB will report a failure by the use of the LEDs. 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 reinitiate the test.

iv. Self test contains only default position

During the self test, the transmission is coded with the default position data listed in T.007 Annex D. The GPS receiver in the PLB1 is not activated during a self test.

No test transmission is transmitted during a GPS receiver test.

v. Protection against transmitting erroneous position data for rescueME PLB1

The navigation information provided by the GPS receiver is checked to ensure a 2D position is available and that the HDOP value is less than 50, before the position is added to the transmitted message. Otherwise the default values are inserted. (With the quoted accuracy of the Quectel L70 GPS receiver and an HDOP of 50 this equates to a position error of approximately 125m)

In addition to checking the HDOP value the PLB microprocessor also parses the format of the received messages from the GNSS receiver and verifies that the checksum sent from the GNSS receiver is correct before using the data. So the format of the data is checked and the content is checked by validating the checksum preventing corrupted data from being encoded into the burst data.

Annex 1: Rakon statement on MTS of five and ten year period

Five year Rakon data



TEST REPORT

Report number	2010-029
Date of issue	6th July 2010
Product description	Temperature Compensated Crystal Oscillator (TCXO)
Product type	CFPT-9000
Rakon Part number	E5344LFT
Construction	Surface mount; 7.0x5.0mm, 10-pad
Output Frequency	12.688750 MHz
Class	II
Number tested	20

TESTS PERFORMED

Mid Term Frequency stability (MTS) over a 6-month period. Data is used to predict the performance of the device over a 5-year period.

Test sequence

- 1) Measure MTS over the temperature range -20°C to +55°C to -20°C
- 2) Store for 1-month at room temperature (+20°C ± 5°C)
- 3) Measure MTS over the temperature range -20°C to +55°C to -20°C
- 4) Store for 1-month at room temperature (+20°C ± 5°C)
- 5) Repeat testing & storage sequence for a further 4 months

Applicable standard

Cospas-Sarsat T.007, issue 4, revision 3

SUMMARY OF TEST RESULTS

TEST	PASS	FAIL	REMARKS
Residual (5-year prediction)	20	0	Minimum Cpk = 1.488
Minimum Static Slope (5-year prediction)	20	0	Minimum Cpk = 5.794
Maximum Static Slope (5-year prediction)	20	0	Minimum Cpk = 12.391
Minimum Gradient Slope (5-year prediction)	20	0	Minimum Cpk = 1.431
Maximum Gradient Slope (5-year prediction)	20	0	Minimum Cpk = 1.428
Aging Mid Frequency (5-year prediction)	20	0	Minimum Cpk = 28.250

CONCLUSIONS

The conclusion reached following the analysis of the data contained within this report indicates that the failure rate for this product after 5-years operation will be less than 3000 ppm.

Testing conducted by
 Report prepared by
 Report approved by

Ian Payne
 David Lowrie
 David R Woodall

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MEDIUM TERM FREQUENCY STABILITY (MTS) - 5-YEAR PREDICTION

Device: E5344LFT Frequency: 12.688750 MHz Class: II Package: SM (7x5.0mm),10-pad Date: 06-July-2010

RESIDUAL (ppb)

Maximum	1.223
Minimum	0.267
Mean	0.741
Standard Deviation	0.249
Upper Spec. Limit	3.000

	2 Sigma (95% Conf.)	3 Sigma (99% Conf.)
Calc. Max. value	1.239	1.488
Cpk (Upper)	n/a	3.023

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MEDIUM TERM FREQUENCY STABILITY (MTS) - 5-YEAR PREDICTION

Device: E5344LFT	Frequency: 12.688750 MHz	Class: II	Package: SM (7x5.0mm),10-pad	Date: 06-July-2010					
MINIMUM STATIC SLOPE (ppb/min)									
Serial Number / Time (Days)	1	30	60	90	150	180	Slope	Intercept	Predicted Minimum Static Slope after 5 years
1	-0.03	-0.01	-0.01	-0.01	-0.03	-0.03	0.002	-0.024	-0.016
3	-0.11	-0.10	-0.13	-0.12	-0.14	-0.13	-0.011	-0.104	-0.140
7	-0.17	-0.15	-0.25	-0.17	-0.15	-0.16	0.000	-0.176	-0.174
9	-0.08	-0.08	-0.09	-0.07	-0.08	-0.08	0.001	-0.081	-0.079
11	-0.15	-0.14	-0.14	-0.14	-0.13	-0.14	0.006	-0.150	-0.130
13	-0.08	-0.08	-0.08	-0.07	-0.08	-0.07	0.003	-0.081	-0.072
17	-0.19	-0.13	-0.01	-0.01	-0.02	-0.03	0.082	-0.197	0.070
19	-0.08	-0.11	-0.14	-0.10	-0.09	-0.09	-0.007	-0.090	-0.114
21	-0.11	-0.12	-0.08	-0.08	-0.09	-0.08	0.014	-0.115	-0.071
27	-0.08	-0.08	-0.03	-0.05	-0.04	-0.07	0.014	-0.081	-0.036
29	-0.05	-0.05	-0.11	-0.06	-0.07	-0.08	-0.013	-0.049	-0.091
31	-0.08	-0.09	-0.08	-0.08	-0.07	-0.09	0.000	-0.082	-0.081
33	-0.02	-0.06	-0.09	-0.02	-0.05	-0.08	-0.018	-0.024	-0.083
37	-0.10	-0.09	-0.13	-0.10	-0.10	-0.11	-0.004	-0.099	-0.111
44	-0.05	-0.06	-0.05	-0.05	-0.06	-0.06	-0.003	-0.050	-0.060
46	-0.08	-0.09	-0.07	-0.07	-0.07	-0.07	0.005	-0.084	-0.066
52	-0.06	-0.10	-0.12	-0.11	-0.12	-0.11	-0.025	-0.062	-0.145
54	-0.06	-0.08	-0.11	-0.07	-0.08	-0.10	-0.013	-0.062	-0.105
56	-0.08	-0.11	-0.09	-0.11	-0.11	-0.11	-0.013	-0.081	-0.123
60	-0.04	-0.06	-0.07	-0.08	-0.06	-0.07	-0.014	-0.042	-0.086
					Maximum Minimum Mean Standard Deviation Upper Spec. Limit Lower Spec. Limit	0.070 -0.174 -0.086 0.053 1.000 -1.000			
					2 Sigma (95% Conf.)	0.072			
					Calc. Max. value	0.020			
					Calc. Min. value	-0.191			
					Cpk (Upper)	n/a			
					Cpk (Lower)	n/a			
					2 Sigma (99% Conf.)	6.880			
					Cpk (Upper)	5.794			
					Cpk (Lower)	n/a			


MEDIUM TERM FREQUENCY STABILITY (MTS) - 5-YEAR PREDICTION

Device: E5344LFT	Frequency: 12.688750 MHz	Class: II	Package: SM (7x5.0mm),10-pad	Date: 06-July-2010
MAXIMUM STATIC SLOPE (ppb/min)				

Serial Number / Time (Days)	1	30	60	90	150	180	Slope	Intercept	Predicted Maximum Static Slope after 5 years
1	0.10	0.08	0.19	0.08	0.12	0.09	0.005	0.103	0.118
3	0.12	0.06	0.11	0.07	0.06	0.10	-0.017	0.114	0.059
7	0.05	0.06	0.05	0.06	0.05	0.07	0.004	0.050	0.064
9	0.04	0.05	0.02	0.02	0.05	0.07	0.004	0.035	0.048
11	0.08	0.08	0.05	0.07	0.07	0.11	0.001	0.074	0.079
13	0.06	0.04	0.05	0.08	0.05	0.08	0.004	0.053	0.067
17	0.23	0.21	0.14	0.13	0.11	0.10	-0.057	0.245	0.059
19	0.06	0.09	0.03	0.17	0.05	0.06	0.007	0.066	0.088
21	0.08	0.10	0.06	0.09	0.07	0.08	-0.002	0.084	0.076
27	0.12	0.07	0.07	0.10	0.16	0.12	0.004	0.100	0.113
29	0.09	0.07	0.05	0.08	0.09	0.08	-0.004	0.083	0.070
31	0.06	0.06	0.05	0.05	0.06	0.11	0.008	0.052	0.078
33	0.11	0.07	0.12	0.12	0.13	0.12	0.008	0.099	0.125
37	0.07	0.07	0.04	0.11	0.10	0.08	0.009	0.063	0.094
44	0.01	0.04	0.02	0.03	0.02	0.05	0.010	0.012	0.046
46	0.06	0.05	0.05	0.08	0.05	0.06	0.000	0.058	0.059
52	0.05	0.05	0.08	0.07	0.05	0.08	0.009	0.049	0.078
54	0.05	0.07	0.03	0.06	0.05	0.09	0.007	0.048	0.069
56	0.04	0.05	0.03	0.04	0.06	0.04	0.002	0.039	0.047
60	0.17	0.14	0.19	0.13	0.15	0.11	-0.016	0.174	0.121
									Maximum 0.125 Minimum 0.046 Mean 0.078 Standard Deviation 0.025 Upper Spec. Limit 1.000 Lower Spec. Limit -1.000
									2 Sigma (95% Conf.) 0.127 Calc. Max. value 0.028 Calc. Min. value n/a Cpk (Upper) n/a Cpk (Lower) 12.391 14.484
									3 Sigma (99% Conf.) 0.152 0.003 12.391 14.484


MEDIUM TERM FREQUENCY STABILITY (MTS) - 5-YEAR PREDICTION

Device: E5344LFT	Frequency: 12.688750 MHz	Class: II	Package: SM (7x5.0mm),10-pad	Date: 06-July-2010
MINIMUM GRADIENT SLOPE (ppb/min)				

Serial Number / Time (Days)	1	30	60	90	150	180	Slope	Intercept	Predicted Minimum Gradient Slope after 5 years
1	-1.01	-0.91	-0.90	-0.92	-0.93	-0.95	0.035	-0.993	-0.879
3	-1.01	-1.00	-1.07	-1.00	-0.99	-1.04	-0.005	-1.011	-1.026
7	-0.73	-0.72	-0.78	-0.72	-0.72	-0.74	-0.002	-0.732	-0.738
9	-0.52	-0.50	-0.49	-0.50	-0.50	-0.49	0.012	-0.519	-0.481
11	-0.20	-0.17	-0.22	-0.18	-0.20	-0.22	-0.004	-0.192	-0.205
13	-0.33	-0.28	-0.25	-0.25	-0.24	-0.23	0.043	-0.333	-0.192
17	-0.49	-0.45	-0.60	-0.45	-0.52	-0.55	-0.019	-0.480	-0.541
19	-0.69	-0.66	-0.64	-0.65	-0.66	-0.65	0.018	-0.687	-0.629
21	-1.18	-1.16	-1.16	-1.15	-1.17	-1.19	0.003	-1.173	-1.163
27	-0.97	-0.94	-0.83	-0.90	-1.05	-1.09	-0.023	-0.927	-1.001
29	-0.99	-0.95	-0.94	-0.96	-0.95	-0.94	0.020	-0.987	-0.922
31	-0.83	-0.83	-0.83	-0.84	-0.75	-0.79	0.019	-0.843	-0.780
33	-1.01	-1.03	-0.98	-1.00	-1.03	-1.05	-0.007	-1.005	-1.029
37	-0.26	-0.26	-0.25	-0.26	-0.27	-0.34	-0.016	-0.248	-0.300
44	-0.47	-0.49	-0.54	-0.58	-0.53	-0.55	-0.038	-0.465	-0.590
46	-0.84	-0.83	-0.79	-0.76	-0.71	-0.75	0.048	-0.857	-0.701
52	-0.42	-0.42	-0.44	-0.46	-0.49	-0.48	-0.028	-0.407	-0.497
54	-0.97	-1.00	-1.01	-1.01	-1.03	-1.04	-0.028	-0.966	-1.055
56	-0.35	-0.33	-0.35	-0.37	-0.35	-0.39	-0.010	-0.340	-0.373
60	-0.35	-0.27	-0.29	-0.27	-0.25	-0.30	0.034	-0.342	-0.233
								Maximum Minimum Mean Standard Deviation Upper Spec. Limit Lower Spec. Limit	-0.192 -1.163 -0.667 0.311 2.000 -2.000
								2 Sigma (95% Conf.) Calc. Max. value Calc. Min. value Cpk (Upper) Cpk (Lower)	0.265 -1.288 -1.599 n/a 2.862
								3 Sigma (99% Conf.) n/a	1.431


MEDIUM TERM FREQUENCY STABILITY (MTS) - 5-YEAR PREDICTION

Device: E5344LFT	Frequency: 12.688750 MHz	Class: II	Package: SM (7x5.0mm),10-pad	Date: 06-July-2010					
MAXIMUM GRADIENT SLOPE (ppb/min)									
Serial Number / Time (Days)	1	30	60	90	150	180	Slope	Intercept	Predicted Maximum Gradient Slope after 5 years
1	1.26	0.92	0.97	1.00	1.02	1.02	-0.111	1.210	0.848
3	1.06	1.04	1.01	1.04	1.06	1.05	-0.006	1.052	1.034
7	0.55	0.57	0.60	0.63	0.66	0.68	0.052	0.532	0.700
9	0.45	0.44	0.45	0.44	0.43	0.43	-0.008	0.452	0.427
11	0.19	0.19	0.18	0.19	0.20	0.20	0.003	0.187	0.197
13	0.19	0.19	0.17	0.17	0.17	0.18	-0.008	0.191	0.165
17	1.05	1.06	0.39	0.48	0.52	0.54	-0.270	1.108	0.227
19	0.69	0.68	0.69	0.74	0.69	0.70	0.007	0.687	0.710
21	1.14	1.17	1.16	1.15	1.16	1.18	0.012	1.141	1.179
27	0.69	0.67	0.49	0.45	0.45	0.49	-0.109	0.715	0.360
29	0.99	0.95	0.92	0.92	0.93	0.93	-0.030	0.988	0.891
31	0.86	0.85	0.86	0.91	0.78	0.77	-0.024	0.878	0.798
33	1.08	1.05	1.06	1.06	1.07	1.09	-0.002	1.071	1.066
37	0.28	0.26	0.23	0.24	0.24	0.24	-0.020	0.280	0.216
44	0.44	0.46	0.49	0.51	0.52	0.55	0.042	0.427	0.564
46	0.97	0.87	0.60	0.62	0.62	0.65	-0.166	0.988	0.449
52	0.38	0.39	0.38	0.40	0.41	0.42	0.014	0.374	0.420
54	0.95	0.95	0.95	0.95	0.96	0.97	0.005	0.946	0.964
56	0.33	0.33	0.37	0.37	0.39	0.40	0.029	0.319	0.412
60	0.25	0.26	0.23	0.22	0.22	0.21	-0.017	0.258	0.204
					Maximum Minimum Mean Standard Deviation Upper Spec. Limit Lower Spec. Limit				
					1.179 0.165 0.592 0.329 2.000 -2.000				
					2 Sigma (95% Conf.) Calc. Max. value Calc. Min. value Cpk (Upper) Cpk (Lower)				
					1.249 -0.066 n/a n/a				
					1.578 -0.395 1.428 2.628				
					3 Sigma (99% Conf.)				



MEDIUM TERM FREQUENCY STABILITY (MTS) - 5-YEAR PREDICTION

Device: E5344LFT	Frequency: 12.688750 MHz	Class: II	Package: SM (7x5.0mm),10-pad	Date: 06-July-2010
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AGING - MID FREQUENCY (ppm)

Serial Number / Time (Days)	1	30	60	90	150	180	Slope	Intercept	Predicted Aging-Mid Frequency after 5 years
1	-0.19	-0.20	-0.18	-0.19	-0.20	-0.20	-0.003	-0.189	-0.198
3	-0.09	-0.09	-0.12	-0.14	-0.15	-0.16	-0.029	-0.078	-0.173
7	0.07	0.06	0.01	0.00	-0.01	-0.01	-0.037	0.080	-0.042
9	-0.03	-0.03	-0.12	-0.14	-0.15	-0.15	-0.057	-0.011	-0.198
11	0.00	-0.04	-0.07	-0.08	-0.09	-0.09	-0.041	0.005	-0.130
13	0.00	0.01	-0.06	-0.07	-0.08	-0.08	-0.038	0.015	-0.110
17	-0.06	0.06	-0.12	-0.15	-0.15	-0.15	-0.048	-0.018	-0.174
19	0.02	0.00	-0.05	-0.06	-0.07	-0.07	-0.042	0.029	-0.108
21	0.03	0.03	-0.03	-0.04	-0.05	-0.05	-0.038	0.042	-0.081
27	-0.03	-0.03	-0.09	-0.10	-0.12	-0.12	-0.041	-0.015	-0.150
29	0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.032	0.027	-0.078
31	-0.04	-0.05	-0.11	-0.12	-0.05	-0.05	-0.015	-0.047	-0.094
33	-0.05	-0.05	-0.17	-0.18	-0.19	-0.20	-0.069	-0.028	-0.255
37	0.08	0.06	0.01	0.00	-0.01	-0.01	-0.042	0.089	-0.048
44	-0.03	-0.04	-0.10	-0.11	-0.12	-0.13	-0.044	-0.017	-0.161
46	0.07	0.07	0.01	0.00	-0.02	-0.02	-0.041	0.085	-0.050
52	0.00	-0.01	-0.07	-0.09	-0.09	-0.10	-0.045	0.013	-0.135
54	0.03	0.03	-0.02	-0.03	-0.03	-0.03	-0.029	0.039	-0.057
56	0.00	-0.01	-0.05	-0.06	-0.06	-0.06	-0.029	0.007	-0.088
60	0.03	0.03	-0.02	-0.03	-0.04	-0.04	-0.033	0.041	-0.066
								Maximum	-0.042
								Minimum	-0.255
								Mean	-0.120
								Standard Deviation	0.060
								Upper Spec. Limit	4.925
								Lower Spec. Limit	-12.315
								2 Sigma (95% Conf.)	0.059
								Calc. Max. value	0.000
								Calc. Min. value	-0.239
								Cpk (Upper)	n/a
								Cpk (Lower)	28.250
									n/a
									68.296
								3 Sigma (99% Conf.)	

Ten year Rakon data



TEST REPORT

Report number	2012-137
Date of issue	26th November 2012
Product description	Temperature Compensated Crystal Oscillator (TCXO)
Product type	CFPT-9000
Rakon Part number	E5344LFT
Construction	Surface mount; 7.0x5.0mm, 10-pad
Output Frequency	12.688750 MHz
Class	II
Number tested	20

TESTS PERFORMED

Mid Term Frequency stability (MTS) measurements are made over a 6-month period. This data is used to predict the performance of the device over a 10-year period.

Test sequence

- 1) Measure MTS over the temperature range -20°C to +55°C to -20°C
- 2) Store for 1-month at room temperature (+20°C ± 5°C)
- 3) Measure MTS over the temperature range -20°C to +55°C to -20°C
- 4) Store for 1-month at room temperature (+20°C ± 5°C)
- 5) Repeat testing & storage sequence for a further 4 months

This data was collected between February & July 2010.

Applicable standard

Cospas-Sarsat T.007, issue 4, revision 6

SUMMARY OF TEST RESULTS

TEST	PASS	FAIL	REMARKS
Residual (10-year prediction)	20	0	Minimum Cpk = 2.85
Minimum Static Slope (10-year prediction)	20	0	Minimum Cpk = 5.26
Maximum Static Slope (10-year prediction)	20	0	Minimum Cpk = 11.89
Minimum Gradient Slope (10-year prediction)	20	0	Minimum Cpk = 1.42
Maximum Gradient Slope (10-year prediction)	20	0	Minimum Cpk = 1.40
Aging Mid Frequency (10-year prediction)	20	0	Minimum Cpk = 27.62

CONCLUSIONS

The conclusion reached following the analysis of the data contained within this report indicates that the failure rate for this product after 10-years operation will be less than 3500 ppm.

Testing conducted by

Ian Payne

Report prepared by

David R Woodall

Report approved by

David R Woodall

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MEDIUM TERM FREQUENCY STABILITY (MTS) - 10-YEAR PREDICTION

Device: E5344LFT	Frequency: 12.688750 MHz	Class: II	Package: SM (7x5.0mm),10-pad	Date: 26-Nov-2012
RESIDUAL (ppb)				

RESIDUAL (ppb)								Predicted Residual after 10 years	
Serial Number / Time (Days)	1	30	60	90	150	180	Slope	Intercept	
1	1.07	1.04	0.61	0.45	0.53	0.55	-0.268	1.138	0.185
3	1.06	1.53	1.07	1.00	1.01	1.10	-0.024	1.166	1.082
7	0.64	0.64	0.63	0.62	0.65	0.62	-0.005	0.641	0.624
9	0.38	0.41	0.21	0.31	0.54	0.67	0.063	0.318	0.544
11	0.43	0.43	0.21	0.39	0.56	0.60	0.038	0.376	0.511
13	0.59	0.70	0.61	0.80	0.82	0.77	0.089	0.573	0.888
17	1.34	1.36	1.38	0.56	0.89	1.39	-0.140	1.379	0.879
19	0.59	0.53	0.48	0.53	0.52	0.54	-0.030	0.580	0.473
21	1.62	1.36	0.73	1.13	0.89	0.99	-0.319	1.632	0.497
27	1.27	1.21	0.80	0.98	1.24	1.66	0.018	1.165	1.228
29	0.72	0.80	0.62	0.86	0.83	0.74	0.028	0.717	0.816
31	0.73	0.91	0.64	0.62	0.74	0.93	0.017	0.735	0.794
33	0.89	0.95	0.82	0.96	1.00	1.45	0.123	0.814	1.253
37	0.57	0.59	0.29	1.09	0.82	0.76	0.113	0.505	0.908
44	0.63	0.60	0.55	0.68	0.74	0.74	0.041	0.592	0.736
46	0.90	0.95	0.89	0.85	0.82	0.87	-0.026	0.922	0.829
52	0.43	0.39	0.47	0.38	0.48	0.67	0.051	0.388	0.570
54	0.77	0.76	0.68	0.78	0.82	0.73	-0.002	0.760	0.752
56	0.53	0.53	0.35	0.49	0.63	0.56	0.009	0.500	0.533
60	0.92	0.77	0.65	0.65	0.63	0.97	-0.073	0.882	0.623

-0.075	0.682	0.623
Maximum		1.253
Minimum		0.185
Mean		0.736
Standard Deviation		0.265
Upper Spec. Limit		3.000

	2 Sigma (95% Conf.)	3 Sigma (99% Conf.)
Calc. Max. value	1.266	1.531
Cpk (Upper)	n/a	2.850



rakon

MEDIUM TERM FREQUENCY STABILITY (MTS) - 10-YEAR PREDICTION

Device: E5344LFT Frequency: 12.688750 MHz Class: II Package: SM (7x5.0mm),10-pad Date: 26-Nov-2012

MINIMUM STATIC SLOPE (ppb/min)

Serial Number / Time (Days)	1	30	60	90	150	180	Slope	Intercept	Predicted Minimum Static Slope after 10 years
1	-0.03	-0.01	-0.01	-0.01	-0.03	-0.03	0.002	-0.024	-0.016
3	-0.11	-0.10	-0.13	-0.12	-0.14	-0.13	-0.011	-0.104	-0.143
7	-0.17	-0.15	-0.25	-0.17	-0.15	-0.16	0.000	-0.176	-0.174
9	-0.08	-0.08	-0.09	-0.07	-0.08	-0.08	0.001	-0.081	-0.079
11	-0.15	-0.14	-0.14	-0.14	-0.13	-0.14	0.006	-0.150	-0.128
13	-0.08	-0.08	-0.08	-0.07	-0.08	-0.07	0.003	-0.081	-0.071
17	-0.19	-0.13	-0.01	-0.01	-0.02	-0.03	0.082	-0.197	0.095
19	-0.08	-0.11	-0.14	-0.10	-0.09	-0.09	-0.007	-0.090	-0.116
21	-0.11	-0.12	-0.08	-0.08	-0.09	-0.08	0.014	-0.115	-0.067
27	-0.08	-0.08	-0.03	-0.05	-0.04	-0.07	0.014	-0.081	-0.031
29	-0.05	-0.05	-0.11	-0.06	-0.07	-0.08	-0.013	-0.049	-0.095
31	-0.08	-0.09	-0.08	-0.08	-0.07	-0.09	0.000	-0.082	-0.081
33	-0.02	-0.06	-0.09	-0.02	-0.05	-0.08	-0.018	-0.024	-0.088
37	-0.10	-0.09	-0.13	-0.10	-0.10	-0.11	-0.004	-0.099	-0.112
44	-0.05	-0.06	-0.05	-0.05	-0.06	-0.06	-0.003	-0.050	-0.061
46	-0.08	-0.09	-0.07	-0.07	-0.07	-0.07	0.005	-0.084	-0.065
52	-0.06	-0.10	-0.12	-0.11	-0.12	-0.11	-0.025	-0.062	-0.153
54	-0.06	-0.08	-0.11	-0.07	-0.08	-0.10	0.013	-0.062	-0.110
56	-0.08	-0.11	-0.09	-0.11	-0.11	-0.11	-0.013	-0.081	-0.127
60	-0.04	-0.06	-0.07	-0.08	-0.06	-0.07	-0.014	-0.042	-0.090

Maximum	0.095
Minimum	-0.174
Mean	-0.086
Standard Deviation	0.058
Upper Spec. Limit	1.000
Lower Spec. Limit	-1.000

	2 Sigma (95% Conf.)	3 Sigma (99% Conf.)
Calc. Max. value	0.030	0.088
Calc. Min. value	-0.201	-0.259
Cpk (Upper)	n/a	6.250
Cpk (Lower)	n/a	5.265



MEDIUM TERM FREQUENCY STABILITY (MTS) - 10-YEAR PREDICTION

Device: E5344LFT	Frequency: 12.688750 MHz	Class: II	Package: SM (7x5.0mm),10-pad	Date: 26-Nov-2012
MAXIMUM STATIC SLOPE (ppb/min)				

MAXIMUM STATIC SLOPE (ppb/min)


MEDIUM TERM FREQUENCY STABILITY (MTS) - 10-YEAR PREDICTION

Device: E5344LFT	Frequency: 12.688750 MHz	Class: II	Package: SM (7x5.0mm),10-pad	Date: 26-Nov-2012
MINIMUM GRADIENT SLOPE (ppb/min)				
Serial Number / Time (Days)				
1	30	60	90	150
1	-1.01	-0.91	-0.90	-0.92
3	-1.01	-1.00	-1.07	-1.00
7	-0.73	-0.72	-0.78	-0.72
9	-0.52	-0.50	-0.49	-0.50
11	-0.20	-0.17	-0.22	-0.18
13	-0.33	-0.28	-0.25	-0.25
17	-0.49	-0.45	-0.60	-0.45
19	-0.69	-0.66	-0.64	-0.65
21	-1.18	-1.16	-1.16	-1.15
27	-0.97	-0.94	-0.83	-0.90
29	-0.99	-0.95	-0.94	-0.96
31	-0.83	-0.83	-0.83	-0.84
33	-1.01	-1.03	-0.98	-1.00
37	-0.26	-0.26	-0.25	-0.26
44	-0.47	-0.49	-0.54	-0.58
46	-0.84	-0.83	-0.79	-0.76
52	-0.42	-0.42	-0.44	-0.46
54	-0.97	-1.00	-1.01	-1.01
56	-0.35	-0.33	-0.35	-0.37
60	-0.35	-0.35	-0.27	-0.29
				-0.27
				-0.25
				-0.30
				-0.034
				-0.342
				Predicted Minimum Gradient Slope after 10 years
				-0.869
				-1.027
				-0.739
				-0.477
				-0.206
				-0.179
				-0.547
				-0.624
				-1.162
				-1.008
				-0.916
				-0.774
				-1.031
				-0.305
				-0.601
				-0.686
				-0.505
				-1.064
				-0.377
				-0.223
				-0.179
				-1.162
				-0.666
				0.312
				2.000
				-2.000
				2 Sigma (95% Conf.)
				3 Sigma (99% Conf.)
				-0.042
				0.270
				-1.290
				-1.602
				n/a
				2.849
				1.426

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MEDIUM TERM FREQUENCY STABILITY (MTS) - 10-YEAR PREDICTION

MAXIMUM OPERATING CONDITIONS

Device:	Frequency:	Class:	Package:	Date:
E5344LFT	12.688750 MHz	II	SM (7x5.0mm),10-pad	26-Nov-2012

MAXIMUM GRADIENT SLOPE (ppb/min)

Serial Number / Time (Days)	Predicted Maximum Gradient Slope after								
	1	30	60	90	150	180	Slope	Intercept	10 years
1	1.26	0.92	0.97	1.00	1.02	1.02	-0.111	1.210	0.814
3	1.06	1.04	1.01	1.04	1.06	1.05	-0.006	1.052	1.032
7	0.55	0.57	0.60	0.63	0.66	0.68	0.052	0.532	0.716
9	0.45	0.44	0.45	0.44	0.43	0.43	-0.008	0.452	0.425
11	0.19	0.19	0.18	0.19	0.20	0.20	0.003	0.187	0.198
13	0.19	0.19	0.17	0.17	0.17	0.18	-0.008	0.191	0.163
17	1.05	1.06	0.39	0.48	0.52	0.54	-0.270	1.108	0.144
19	0.69	0.68	0.69	0.74	0.69	0.70	0.007	0.687	0.712
21	1.14	1.17	1.16	1.15	1.16	1.18	0.012	1.141	1.183
27	0.69	0.67	0.49	0.45	0.45	0.49	-0.109	0.715	0.327
29	0.99	0.95	0.92	0.92	0.93	0.93	-0.030	0.988	0.882
31	0.86	0.85	0.86	0.91	0.78	0.77	-0.024	0.878	0.791
33	1.08	1.05	1.06	1.06	1.07	1.09	-0.002	1.071	1.065
37	0.28	0.26	0.23	0.24	0.24	0.24	-0.020	0.280	0.210
44	0.44	0.46	0.49	0.51	0.52	0.55	0.042	0.427	0.577
46	0.97	0.87	0.60	0.62	0.62	0.65	-0.166	0.988	0.398
52	0.38	0.39	0.38	0.40	0.41	0.42	0.014	0.374	0.424
54	0.95	0.95	0.95	0.95	0.96	0.97	0.005	0.946	0.965
56	0.33	0.33	0.37	0.37	0.39	0.40	0.029	0.319	0.421
60	0.25	0.26	0.23	0.22	0.22	0.21	-0.017	0.258	0.199
								Maximum	1.183
								Minimum	0.144
								Mean	0.582
								Standard Deviation	0.336
								Upper Spec. Limit	2.000
								Lower Spec. Limit	-2.000
								2 Sigma (95% Conf.)	
								Calc. Max. value	1.254
								Calc. Min. value	-0.089
								Cpk (Upper)	n/a
								Cpk (Lower)	n/a

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MEDIUM TERM FREQUENCY STABILITY (MTS) - 10-YEAR PREDICTION

Device: E5344LFT	Frequency: 12.688750 MHz	Class: II	Package: SM (7x5.0mm),10-pad	Date: 26-Nov-2012
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AGING - MID FREQUENCY (ppm)

Serial Number / Time (Days)	Predicted Aging-Mid Frequency after 10								
	1	30	60	90	150	180	Slope	Intercept	years
1	-0.19	-0.20	-0.18	-0.19	-0.20	-0.20	-0.003	-0.189	-0.198
3	-0.09	-0.09	-0.12	-0.14	-0.15	-0.16	-0.029	-0.078	-0.182
7	0.07	0.06	0.01	0.00	-0.01	-0.01	-0.037	0.080	-0.053
9	-0.03	-0.03	-0.12	-0.14	-0.15	-0.15	-0.057	-0.011	-0.215
11	0.00	-0.04	-0.07	-0.08	-0.09	-0.09	-0.041	0.005	-0.142
13	0.00	0.01	-0.06	-0.07	-0.08	-0.08	-0.038	0.015	-0.121
17	-0.06	0.06	-0.12	-0.15	-0.15	-0.15	-0.048	-0.018	-0.188
19	0.02	0.00	-0.05	-0.06	-0.07	-0.07	-0.042	0.029	-0.121
21	0.03	0.03	-0.03	-0.04	-0.05	-0.05	-0.038	0.042	-0.092
27	-0.03	-0.03	-0.09	-0.10	-0.12	-0.12	-0.041	-0.015	-0.162
29	0.03	-0.03	-0.03	-0.04	-0.04	-0.04	-0.032	0.027	-0.088
31	-0.04	-0.05	-0.11	-0.12	-0.05	-0.05	-0.015	-0.047	-0.098
33	-0.05	-0.05	-0.17	-0.18	-0.19	-0.20	-0.069	-0.028	-0.276
37	0.08	0.06	0.01	0.00	-0.01	-0.01	-0.042	0.089	-0.061
44	-0.03	-0.04	-0.10	-0.11	-0.12	-0.13	-0.044	-0.017	-0.175
46	0.07	0.07	0.01	0.00	-0.02	-0.02	-0.041	0.085	-0.062
52	0.00	-0.01	-0.07	-0.09	-0.09	-0.10	-0.045	0.013	-0.148
54	0.03	0.03	-0.02	-0.03	-0.03	-0.03	-0.029	0.039	-0.066
56	0.00	-0.01	-0.05	-0.06	-0.06	-0.06	-0.029	0.007	-0.097
60	0.03	0.03	-0.02	-0.03	-0.04	-0.04	-0.033	0.041	-0.076
								Maximum	
								Minimum	
								Mean	
								Standard Deviation	
								Upper Spec. Limit	
								Lower Spec. Limit	
								-12.315	
								2 Sigma (95% Conf.)	
								3 Sigma (99% Conf.)	
Calc. Max. value				-0.009				0.052	
Calc. Min. value				-0.253				-0.314	
Cpk (Upper)				n/a				27.624	
Cpk (Lower)				n/a				66.566	

Information that confirms that the nominal output impedance of the beacon power amplifier is 50 Ohms

T.007: 5.k Antenna Matching Analysis

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

(The output impedance of the 121.5MHz power amplifier is 50 Ohms.)

The antenna return loss resulting from the computer model is shown below.

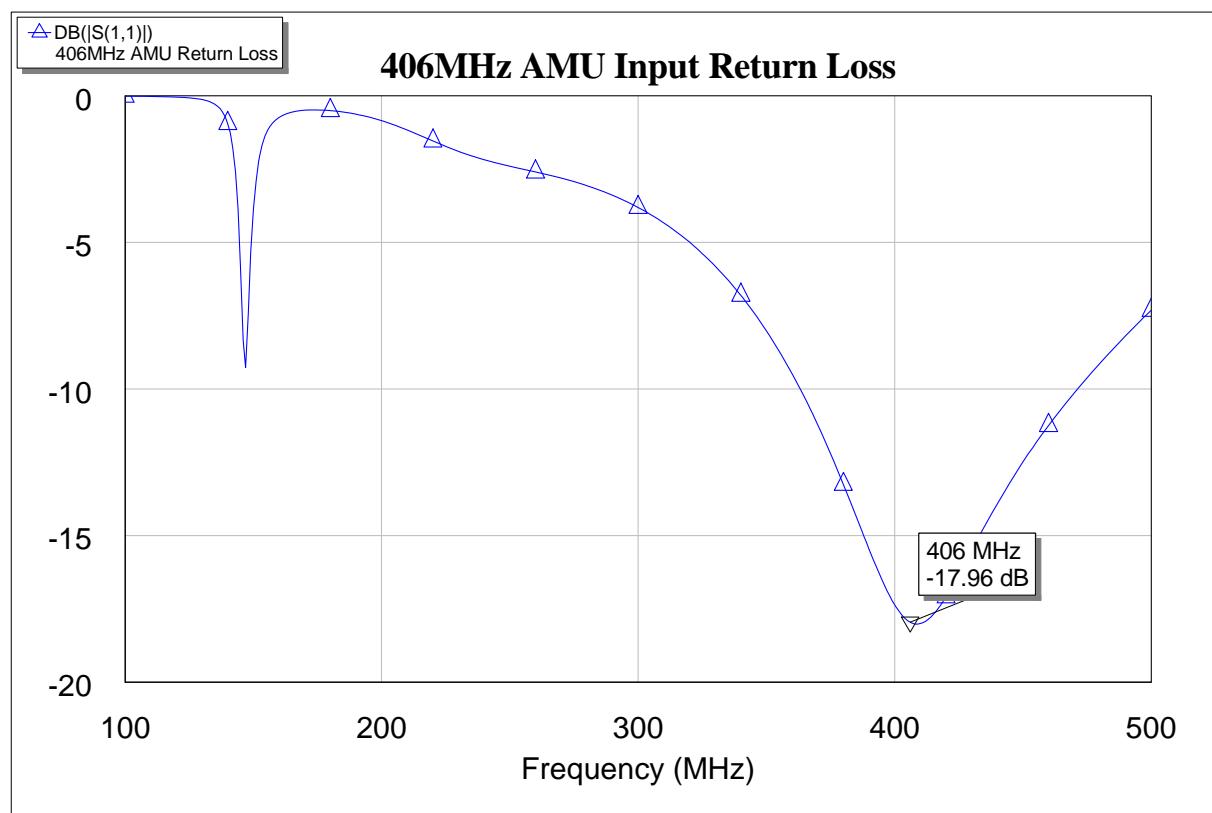


Figure 1: Antenna return loss including matching components.

The measured return loss at 406.040MHz is indicated as -17.96dB.

This gives a calculated VSWR of 1.29:1.

Beacon quality assurance plan