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Report On

Emergency Beacon Testing of the
McMurdo Fastfind Plus PLB



Product Service

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REPORT ON

Emergency Beacon TestingEmergency Beacon Testing of the
McMurdoMcMurdo Fastfind Plus PLBFastfind Plus PLB

Document 75901815 Report 01 Issue 6

January 2008

PREPARED FOR

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Silver Point
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PREPARED BY

A handwritten signature in black ink, appearing to read 'N Bennett', written over a horizontal line.

N Bennett
Administrator

APPROVED BY

A handwritten signature in black ink, appearing to read 'M Jenkins', written over a horizontal line.

M Jenkins
Authorised Signatory

DATED

25 January 2008





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SECTION 1

REPORT SUMMARY

Emergency Beacon Testing of the
McMurdo Fastfind Plus PLB



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1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Emergency Beacon Testing of the McMurdo Fastfind Plus PLB to the requirements of T.007 Issue 4 – Rev 1 October 2006.

Objective	To determine the Equipment Under Test's (EUT's) compliance with the specification/Test Plan, for the series of tests carried out.	
Manufacturer	Signature Industries	
Model Number(s)	Fastfind Plus PLB	
Serial Number(s)	75901815_01	Fastfind Plus PLB, S/N: 800-000001
Number of Samples Tested	One	
Test Specification/Issue/Date	Cospas-Sarsat T.007 Issue 4 – Rev 1 October 2006	
Incoming Release Date	Application Form 1 st August 2007	
Date of Receipt of Test Samples	20 th August 2007	
Order Number	PC0003097	
Date	16 th July 2007	
Start of Test	21 st August 2007	
Finish of Test	5 th December 2007	
Name of Engineer(s)	R Henley	



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1.2 APPLICATION FORM

1.2.1 Beacon Manufacturer and Beacon Model

Beacon Manufacturer	Signature Industries
Beacon Model	Fastfind/Fastfind Plus

1.2.2 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)		☐

1.2.3 Beacon Characteristics

Characteristic	Specification
Operating temperature range	Tmin = -20°C Tmax = +55°C
Operating lifetime	24hrs/48 hours
Battery chemistry	Lithium iron di-sulphide
Battery cell size and number of cells	AA x 7cells
Battery manufacturer	Energizer
Battery pack manufacturer and part number	Manufacturer: All Batteries Part number: 85-722D
Oscillator type (e.g. OCXO, MCXO, TCXO)	TCXO
Oscillator manufacturer	CMAC
Oscillator part name and number	E4520
Oscillator satisfies long-term frequency stability requirements (Yes or No)	Yes



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Characteristic	Specification
Antenna type (Integrated or External)	Integrated
Antenna manufacturer	Doig
Antenna part name and number	85-710B
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)	WGS 84
- GNSS receiver cold start forced at every beacon activation (Yes or No)	Yes
- Navigation device manufacturer	uBlox
- Navigation device model name and part Number	TIM-4P
- GNSS system supported (e.g. GPS, GLONASS, Galileo)	GPS
For External Navigation Devices	
- Data protocol for GNSS receiver to beacon interface	
- Physical interface for beacon to navigation device	
- Electrical interface for beacon to navigation device	
- Navigation device model and manufacturer (if beacon designed to use specific devices)	



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Characteristic	Specification
Self-Test Mode Characteristics	
- Self-test has separate switch position (Yes or No)	Yes
- Self-test switch automatically returns to normal position when released (Yes or No)	Yes
- Self-test activation can cause an operational mode transmission (Yes or 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
- Results of self-test indicated by (e.g. Pass / Fail Indicator Light, Strobe Light, etc.)	Pass/fail LED
- Self-test can be activated from beacon remote activation points (Yes or 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
- Self-test transmits a signal(s) other than at 406 MHz (Yes & details or No)	Yes, 121.5MHz
- Self-test can be activated directly at beacon (Yes or No)	Yes
- List of Items checked by self-test	406.037/121.5MHz power, PLL lock, GPS module
- Self-test transmission burst duration (440 or 520 ms)	520 ms
- Self-test format bit ("0" or "1")	1
Beacon includes a homer transmitter (if yes identify frequency of transmission)	121.5MHz
-Homer Transmit Power	20dBm
-Homer Duty Cycle	99.13%
-Duty Cycle of Homer Swept Tone	34%



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Characteristic	Specification
Beacon includes a strobe light (Yes or No)	No
- Strobe light intensity	N/A
- Strobe light flash rate	N/A
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). List details on a separate sheet if insufficient space to describe.	No
Beacon includes automatic activation mechanism (Yes or No)	No

1.2.4 Information Provided by the Cospas-Sarsat Accepted Test Facility

Name and Location of Beacon Test Facility: TUV Product Service Ltd, United Kingdom

Date of Submission for Testing: August 2007

Applicable C/S Standards:

Document	Issue	Revision	Date
C/S T.001	3	7	Nov-05
C/S T.007	4	1	Oct-06

I hereby confirm that the 406 MHz beacon described above has been successfully tested in accordance with the Cospas-Sarsat Type Approval Standard (C/S T.007) and complies with the Specification for Cospas-Sarsat 406 MHz Distress Beacons (C/S T.001) as demonstrated in the attached report.

Signed:

Name:

M Jenkins

Position Held:

Authorised Signatory

Date:

25 January 2008



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1.2.5 Applicant Details

Company Name	McMurdo		
Address	Silver Point Airport Service Road Hilsea Portsmouth, PO3 5PB		
Category of Applicant	☒ Manufacturer	☐ Importer	
	☐ Distributor	☐ Agent	
Contact Name	Mr Neil Jordan	Telephone	02392623934
Email	neiljordan@mcmurdo.co.uk	Facsimile	02392623997

1.2.6 Manufacturer Details

Company Name	Same as above		
Address			
Contact Name		Telephone	
Email		Facsimile	

1.2.7 Declaration of Build Status

Hardware Version	85-800N
- PCB Revision	Issue B
- Battery Model	
Software Version	
Firmware Version	
Other (Specify)	

1.2.8 Applicant's Declaration

I hereby declare that I am entitled to sign on the behalf of the applicant and that the information supplied is correct and complete

Signed: _____

Name: Neil Jordan

Position Held: Senior Electronics Engineer

Date: 20th August 2007

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a McMurdo Fastfind Plus PLB as shown in the photograph below. A full technical description can be found in the manufacturer's documentation.



Equipment Under Test

1.3.2 Physical Test Configuration

For all tests with the exception of Satellite Qualitative and Antenna Characteristics the PLB was configured such that a BNC connector was connected to the head of the beacon which enabled the unit to be coupled to the test system.



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1.4 MODIFICATIONS

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

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	As supplied by the customer	N/A	N/A
1	The GPS timing handler was modified to begin timing at the end of the next 406 transmission with the new position data, rather than at the point where the message was updated.	McMurdo	05/09/2007

1.5 REPORT MODIFICATION RECORD

Issue 1 – First Issue

Issue 2 – Updated as per C/S Worksheet-1_2007-39

Issue 3 – Updated Test Results Table to include Battery Pre-test discharge time in time to first failure.

Issue 4 – Updated Test Results Table and Operating Lifetime at Minimum Temperature Section to include new values resulting from information supplied by customer.

Issue 5 – Modification made to Test Results Table following information supplied by customer on stated operational life.

Issue 6 - Updated tables for position data encoding for user location protocol, standard location protocol and national location protocol.



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SECTION 2

TEST DETAILS

Emergency Beacon Testing of the
McMurdo Fastfind Plus PLB



Product Service

TEST RESULTS TABLE

Parameter	Limits	Units	Test Results			Comments
			Tmin	Tamb	Tmax	
			(-20°C)	(24.1°C)	(+55°C)	
1. Power Output						Test Sample: 75901815_01 Mod State: 0 Result: Pass
Transmitter power output	35 - 39	dBm	37.49000	37.56433	37.5195	
Power output rise time	< 5	ms	0.054	0.054	0.050	
Power output 1ms before burst	< -10	dBm	-20.46	-18.84	-19.40	
2. Digital Message Coding		Bit Numbers				Test Sample: 75901815_01 Mod State: 0 Result: Pass
Bit Sync	1 – 15	15 bits “1”	P / F	P	P	Decoded Message: Page 19 to 21
Frame sync	16 – 24	“000101111”	P / F	P	P	
Format flag	25	1 bit	bit value	1	1	
Protocol flag	26	1 bit	bit value	0	0	
Identification / position data	59 bits	P / F	P	P	P	
BCH code	86 -106	P / F	P	P	P	
Emerg. Code/nat. use/supplem. Data	6 bits	bit value	110111	110111	110111	
Additional data / BCH (if applicable)	32 bits	P / F	P	P	P	
Position Error (if applicable)	< 5	km	N/A	N/A	N/A	
3. Digital Message Generator						Test Sample: 75901815_01 Mod State: 0 Result: Pass
Repetition rate TR:						
Average TR	48.5 ≤ TRavg ≤ 51.5	seconds	50.006	49.989	49.992	
Minimum TR	47.5 ≤ TRmin ≤ 48.0	seconds	47.750	47.734	47.766	
Maximum TR	52.0 ≤ TRmax ≤ 52.5	seconds	52.156	52.141	52.296	
Standard deviation	0.5 - 2.0	seconds	1.332	1.333	1.344	
Bit rate						
Minimum fb	≥ 396	bits/sec	399.771	399.868	399.931	
Maximum fb	≤ 404	bits/sec	399.788	399.880	399.950	
Total transmission time						
Short message	435.6 - 444.4	ms	N/A	N/A	N/A	
Long message	514.8 - 525.2	ms	522.097	521.996	521.911	
Unmodulated carrier						
Minimum T1	≥ 158.4	ms	161.474	161.440	161.413	
Maximum T1	≤ 161.6	ms	161.484	161.453	161.427	
Fast burst delay	≥ 47.5	seconds	121	121	121	



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Parameter	Limits	Units	Test Results			Comments
			T _{min}	T _{amb}	T _{max}	
			(-20°C)	(24.1°C)	(+55°C)	
4. Modulation						Test Sample: 75901815_01 Mod State: 0 Result: Pass
Biphase-L	P / F	P / F	P	P	P	
Rise time	50 - 250	µs	132.80	132.09	128.80	
Fall time	50 - 250	µs	130.90	136.63	132.97	
Phase deviation: positive	+(1.0 to 1.2)	radians	1.109	1.102	1.112	
Phase deviation: negative	-(1.0 to 1.2)	radians	-1.072	-1.072	-1.106	
Symmetry measurement	≤ 0.05		0.0040	0.0037	0.0035	
5. 406 MHz Transmitted Frequency						Test Sample: 75901815_01 Mod State: 0 Result: Pass
Nominal Value	C/S T.001	MHz	406.036945	406.036936	406.036935	
Short-term stability	≤ 2x10 ⁻⁹	/100ms	1.078x10 ⁻¹⁰	1.045x10 ⁻¹⁰	8.239x10 ⁻¹¹	
Medium-term stability – Slope	(-1 to +1)x10 ⁻⁹	/minutes	4.915x10 ⁻¹²	-1.018x10 ⁻¹⁰	3.199x10 ⁻¹¹	
Medium-term stability – Residual frequency variation	≤ 3x10 ⁻⁹		1.383 x10 ⁻¹⁰	3.339x10 ⁻¹⁰	1.817x10 ⁻¹⁰	
6. Spurious Emission on 50ohms						Test Sample: 75901815_01 Mod State: 0 Result: Pass
In band (406.0 – 406.1 MHz)	C/S T.001 mask	P / F	P	P	P	Spectrum plots: Page 22
7. 406 MHz VSWR Check						Test Sample: 75901815_01 Mod State: 0 Result: Pass
Nominal transmitted frequency	C/S T.001	MHz	406.036946	406.036934	406.036937	Decoded Message: Page 23
Modulation						
Rise time	50-250	µs	126.30	130.31	125.94	
Fall time	50-250	µs	127.03	134.48	135.10	
Phase deviation: positive	+ (1.0 to 1.2)	radians	1.103	1.097	1.115	
Phase deviation: negative	- (1.0 to 1.2)	radians	-1.083	-1.072	-1.101	
Symmetry measurement	≤ 0.05		0.0035	0.0039	0.0035	
Digital Message	correct	P / F	P	P	P	



Product Service

Parameter	Limits	Units	Test Results			Comments
			T _{min}	T _{amb}	T _{max}	
			(-20°C)	(24.1°C)	(+55°C)	
8. Self-test Mode						Test Sample: 75901815_01 Mod State: 0 Result: Pass
Frame sync	011010000	P / F	P	P	P	Decoded Message: Page 24 Applicant's data: See Annex A Applicant's data: See Annex A
Format flag	1 / 0	bit value	1	1	1	
Single radiated burst	≤440 / 520 (±1%)	ms	522.0967	522.0129	521.957	
Default position data (if applicable)	correct	P / F	P	P	P	
Description provided	provided	Y / N	Y			
Design data on protection against repetitive self-test mode transmissions	provided	Y / N	Y			
Single burst verification	one burst	P / F	P	P	P	
Provides for 15 Hex ID	correct	P / F	P	P	P	
121.5 MHz RF power (if applicable)	self-test checks that RF power emitted	P / F	P	P	P	
406 MHz power	self-test checks that RF power emitted	P / F	P	P	P	



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Parameter	Limits	Units	Test Results		Comments	
9. Thermal Shock					Test Sample: 75901815_01 Mod State: 0 Result: Pass	
Soak Temperature	30°C difference	°C	24.1		Test Data: Page 25 to 30	
Measurement Temperature		°C	-5.9			
Transmitted Frequency			Min	Max		
Nominal value	C/S T.001	MHz	406.036944	406.036946		
Short-term stability	≤ 2x10 ⁻⁹	/100ms	5.696X10 ⁻¹¹	1.117x10 ⁻¹⁰		
Medium-term stability – Slope	(-2 to +2)x10 ⁻⁹	/min	-2.069x10 ⁻¹¹	1.675x10 ⁻¹⁰		
Medium-term stability – Residual frequency variation	≤ 3x10 ⁻⁹		5.76x10 ⁻¹¹	1.753x10 ⁻¹⁰		
Transmitter power output	35 - 39	dBm	37.584	37.613		
Digital message	correct	P/F	P		Decoded Message: Page 30	
10 Operating Lifetime at Minimum Temperature					Test Sample: 75901815_01 Mod State: 0 Result: Pass	
Pre-test battery discharge duration (operating)	>24	Hours	5.12		Test Data: Page 31 to 40 Measured 'Operational Time Before First Failure' was 95.01 hours; this is reduced to an Effective Operational Lifetime Duration of 89.27 by removing the required pre-test discharge figure of 5.74 which was not discharged from the battery prior to the test. The customer stated that the Operational Lifetime Duration was 78 hours, our measurements exceed this figure as per above.	
Effective Operational Lifetime Duration		Hours	78			
Transmitted Frequency			Min	Max		
Nominal value		C/S T.001	MHz	406.036937		406.036942
Short-term stability		≤ 2x10 ⁻⁹	/100ms	5.892x10 ⁻¹¹		1.881x10 ⁻¹⁰
Medium-term stability – Slope		(-1 to +1)x10 ⁻⁹	/min	-4.486x10 ⁻¹¹		5.11x10 ⁻¹¹
Medium-term stability – Residual frequency variation		≤ 3x10 ⁻⁹		6.539x10 ⁻¹¹		2.567x10 ⁻¹⁰
Transmitter power output		35 - 39	dBm	36.973		37.019
Digital message	correct	P/F	P		Decoded Message: Page 36	
11. Temperature Gradient (5°C/hr)					Test Sample: 75901815_01 Mod State: 1 Result:	
Transmitted Frequency	C/S T.007	MHz	Min	Max	Test Data: Page 41 to 46 Limits between points B to C+15 minutes and D to E+15 minutes as per C/S T.007 are (-2 to +2)x10 ⁻⁹	
Nominal value			406.036917	406.036946		
Short-term stability			5.17x10 ⁻¹¹	1.659x10 ⁻¹⁰		
Medium-term stability – Slope			-7.835x10 ⁻¹⁰	1.958x10 ⁻¹⁰		
Medium-term stability – Residual frequency variation			5.031x10 ⁻¹¹	2.489x10 ⁻⁹		
Transmitter power output			37.236	37.462		
Digital message			P			
Decoded Message: Page 46						



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Parameter	Limits	Units	Test Results			Comments
12. Oscillator Aging						
Data	provided	Y / N	N			Applicant to submit.
13. Protection Against Continuous Transmission						
Description	provided	Y / N	Y			Applicant's data: Annex A
14. Satellite Qualitative Tests						
Test Configuration	C/S T.007	Figure	Resting on Dry Ground	B.5		
15 Hex ID Decoded by LUT	correct	P / F	P	P		
Doppler Location results with error ≤5km	≥80	%	100	100		
15. Antenna Characteristics						
Test Configuration	C/S T.007	Figure	B.2	B.5		
Polarisation	linear or RHCP	dB	linear	linear		
VSWR	≤1.5		N/A	N/A		
EIRP _{LOSS}			0.524			
EIRP _{maxEOL}	≤43		43.0	41.4		
EIRP _{minEOL}	≥32		33.576	34.776		
Azimuth gain variation at 40° elevation angle	≤3		1.17	N/A		
16. Beacon Coding System						
Sample message for each coding option of the applicable coding types	correct	P / F	P	P	P	Test Data: Page 51 to 52
Sample self-test message for each coding option of the applicable coding types	correct	P / F	P	P	P	



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Parameter	Limits	Units	Test Results			Comments
17. Navigation System						Test Sample: 75901815_01 Mod State: 1 Result: Pass
Location protocol	C/S T.001		National	Standard	User	Test Data: Page 53 to 61
Position data default values	correct	P / F	P	P	P	
Position acquisition time	<10/1	Sec	121	121	121	
Position accuracy	C/S T.001	P/F	P	P	P	
Encoded position data update interval	>20	Min	20m 51s	20m 52s	20m 52s	
Position clearance after deactivation	cleared	P / F	P	P	P	
Position data input update interval (as applicable)	20/1	Min	N/A	N/A	N/A	
Position data encoding	correct	P / F	P	P	P	These tests were performed at the manufactures laboratory. All results were provided to TUV for use in this report
Retained last valid position after navigation input lost	240(±5)	Minutes	236	238	240	
Default position data transmitted after 240(±5) minutes without valid position data	cleared	P / F	P	P	P	
Information on protection against beacon degradation due to navigation device, interface or signal failure or malfunction	provided	P / F	P	P	P	Applicant's data: See Annex A



Product Service

2.1 DIGITAL MESSAGE CODING

2.1.1 Equipment Under Test

Fastfind Plus PLB, Serial Number: 800-000001

2.1.2 Date of Test and Modification State

21st August 2007, Modification State 0

2.1.3 Test Equipment Used

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

2.1.4 Test Results

Digital Message at Ambient Temperature

Beacon Id Format..... 30 Hex Id, Long Message, Bits 25-144
 15 Hex (Bits 26- 85) = 192FF380C6FFBFF 192FF380C6FFBFF Default_Id
 36 Hex (Bits 25-144) = FFE2F8C97F9C0637FDFFF11B23783E0F66C

26	30	34	38	42	46	50	54	58	62	66	70	74	78	82
1	0001	1001	0010	1111	1111	0011	1000	0000	1100	0110	1111	1111	1011	1111
	1110	0010	0011	0110	0100	0110	1111	0000	0111	1100	0001	1110	1100	1101
														100
86	90	94	98	102	106	110	114	118	122	126	130	134	138	142

Field Name	Bit Pos	Value Decode	Bits
-----	-----	-----	----
Format Flag	25	1 Long Message	1
Protocol Flag	26	0 Location NEW	0
MID	27- 36	201 ALBANIA	0011 0010 01
Protocol Code	37- 40	7 PLB - Serial (Standard)	0111
CSTA Number	41- 50	999	1111 1001 11
Serial Number	51- 64	99	0000 0001 1000 11
Coarse Position	65- 85	DEFAULT	0111 1111 1101 1111 1111 1
BCH Encoded	86-106	Errors=0	1110 0010 0011 0110 0100 0
BCH Generated	86-106		1110 0010 0011 0110 0100 0
Long Message	107-144	Data Present	
Fixed Bits	107-109		110
Fixed Bit	110	1	1
Encode Pos Device	111	1 Internal	1
121.5 Homing	112	1 YES	1
Position Change	113-132	DEFAULT	1000 0011 1110 0000 1111
Resultant Position		--> Not Defined	
BCH Encoded	133-144	Errors=0	0110 0110 1100
BCH Generated	133-144		0110 0110 1100



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Digital Message at Minimum Temperature

Beacon Id Format..... 30 Hex Id, Long Message, Bits 25-144

15 Hex (Bits 26- 85) = 192FF380C6FFBFF 192FF380C6FFBFF Default_Id

36 Hex (Bits 25-144) = FFFE2F8C97F9C0637FDFFF11B23783E0F66C

26	30	34	38	42	46	50	54	58	62	66	70	74	78	82
1	0001	1001	0010	1111	1111	0011	1000	0000	1100	0110	1111	1111	1011	1111
	1110	0010	0011	0110	0100	0110	1111	0000	0111	1100	0001	1110	1100	1101
														100
86	90	94	98	102	106	110	114	118	122	126	130	134	138	142

Field Name	Bit Pos	Value Decode	Bits
-----	-----	-----	----
Format Flag	25	1 Long Message	1
Protocol Flag	26	0 Location NEW	0
MID	27- 36	201 ALBANIA	0011 0010 01
Protocol Code	37- 40	7 PLB - Serial (Standard)	0111
CSTA Number	41- 50	999	1111 1001 11
Serial Number	51- 64	99	0000 0001 1000 11
Coarse Position	65- 85	DEFAULT	0111 1111 1101 1111 1111 1
BCH Encoded	86-106	Errors=0	1110 0010 0011 0110 0100 0
BCH Generated	86-106		1110 0010 0011 0110 0100 0
Long Message	107-144	Data Present	
Fixed Bits	107-109		110
Fixed Bit	110	1	1
Encode Pos Device	111	1 Internal	1
121.5 Homing	112	1 YES	1
Position Change	113-132	DEFAULT	1000 0011 1110 0000 1111
Resultant Position		--> Not Defined	
BCH Encoded	133-144	Errors=0	0110 0110 1100
BCH Generated	133-144		0110 0110 1100



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Digital Message at Maximum Temperature

Beacon Id Format..... 30 Hex Id, Long Message, Bits 25-144

15 Hex (Bits 26- 85) = 192FF380C6FFBFF 192FF380C6FFBFF Default_Id

36 Hex (Bits 25-144) = FFFE2F8C97F9C0637FDFFF11B23783E0F66C

26	30	34	38	42	46	50	54	58	62	66	70	74	78	82
1	0001	1001	0010	1111	1111	0011	1000	0000	1100	0110	1111	1111	1011	1111
	1110	0010	0011	0110	0100	0110	1111	0000	0111	1100	0001	1110	1100	1101
														100
86	90	94	98	102	106	110	114	118	122	126	130	134	138	142

Field Name	Bit Pos	Value Decode	Bits
-----	-----	-----	----
Format Flag	25	1 Long Message	1
Protocol Flag	26	0 Location NEW	0
MID	27- 36	201 ALBANIA	0011 0010 01
Protocol Code	37- 40	7 PLB - Serial (Standard)	0111
CSTA Number	41- 50	999	1111 1001 11
Serial Number	51- 64	99	0000 0001 1000 11
Coarse Position	65- 85	DEFAULT	0111 1111 1101 1111 1111 1
BCH Encoded	86-106	Errors=0	1110 0010 0011 0110 0100 0
BCH Generated	86-106		1110 0010 0011 0110 0100 0
Long Message	107-144	Data Present	
Fixed Bits	107-109		110
Fixed Bit	110	1	1
Encode Pos Device	111	1 Internal	1
121.5 Homing	112	1 YES	1
Position Change	113-132	DEFAULT	1000 0011 1110 0000 1111
Resultant Position		--> Not Defined	
BCH Encoded	133-144	Errors=0	0110 0110 1100
BCH Generated	133-144		0110 0110 1100



Product Service

2.2 SPURIOUS EMISSIONS

2.2.1 Equipment Under Test

Fastfind Plus PLB, Serial Number: 800-000001

2.2.2 Date of Test and Modification State

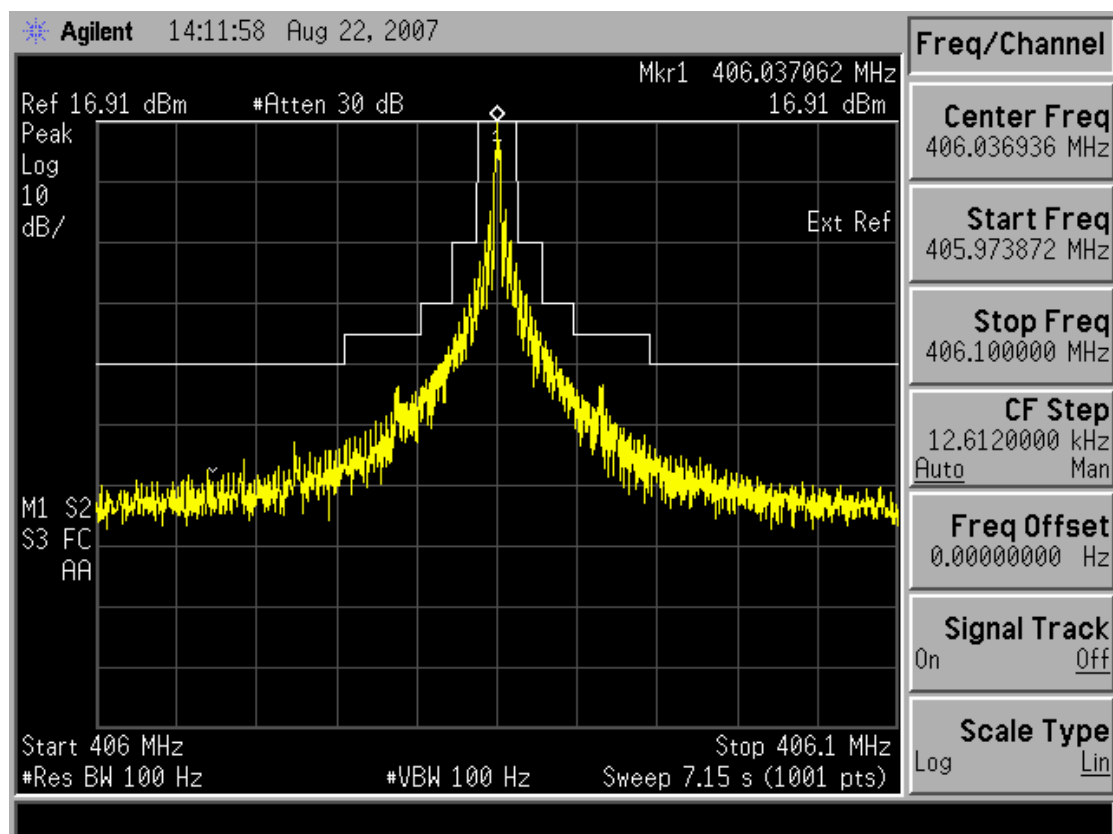
21st August 2007, Modification State 0

2.2.3 Test Equipment Used

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

2.2.4 Test Results

Combined plot at -20°C, ambient and +55°C





Product Service

2.3 406 MHZ VSWR CHECK – DECODED MESSAGE

2.3.1 Equipment Under Test

Fastfind Plus PLB, Serial Number: 800-000001

2.3.2 Date of Test and Modification State

21st August 2007, Modification State 0

2.3.3 Test Equipment Used

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

2.3.4 Test Results

Digital Message

Beacon Id Format..... 30 Hex Id, Long Message, Bits 25-144
 15 Hex (Bits 26- 85) = 192FF380C6FFBFF 192FF380C6FFBFF Default_Id
 36 Hex (Bits 25-144) = FFE2F8C97F9C0637FDFFF11B23783E0F66C

26	30	34	38	42	46	50	54	58	62	66	70	74	78	82
1	0001	1001	0010	1111	1111	0011	1000	0000	1100	0110	1111	1111	1011	1111
	1110	0010	0011	0110	0100	0110	1111	0000	0111	1100	0001	1110	1100	1101
	86	90	94	98	102	106	110	114	118	122	126	130	134	138
														142

Field Name	Bit Pos	Value Decode	Bits
-----	-----	-----	----
Format Flag	25	1 Long Message	1
Protocol Flag	26	0 Location NEW	0
MID	27- 36	201 ALBANIA	0011 0010 01
Protocol Code	37- 40	7 PLB - Serial (Standard)	0111
CSTA Number	41- 50	999	1111 1001 11
Serial Number	51- 64	99	0000 0001 1000 11
Coarse Position	65- 85	DEFAULT	0111 1111 1101 1111 1111 1
BCH Encoded	86-106	Errors=0	1110 0010 0011 0110 0100 0
BCH Generated	86-106		1110 0010 0011 0110 0100 0
Long Message	107-144	Data Present	
Fixed Bits	107-109		110
Fixed Bit	110	1	1
Encode Pos Device	111	1 Internal	1
121.5 Homing	112	1 YES	1
Position Change	113-132	DEFAULT	1000 0011 1110 0000 1111
Resultant Position		--> Not Defined	
BCH Encoded	133-144	Errors=0	0110 0110 1100
BCH Generated	133-144		0110 0110 1100



Product Service

2.4 SELF-TEST MODE – DECODED MESSAGE

2.4.1 Equipment Under Test

Fastfind Plus PLB, Serial Number: 800-000001

2.4.2 Date of Test and Modification State

21st August 2007, Modification State 0

2.4.3 Test Equipment Used

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

2.4.4 Test Results

Digital Message

Beacon Id Format..... 30 Hex Id, Long Message, Bits 25-144
 15 Hex (Bits 26- 85) = 192FF380C6FFBFF 192FF380C6FFBFF Default_Id
 36 Hex (Bits 25-144) = FFFED08C97F9C0637FDFFF11B23783E0F66C

26	30	34	38	42	46	50	54	58	62	66	70	74	78	82
1	0001	1001	0010	1111	1111	0011	1000	0000	1100	0110	1111	1111	1011	1111
	1110	0010	0011	0110	0100	0110	1111	0000	0111	1100	0001	1110	1100	1101
	86	90	94	98	102	106	110	114	118	122	126	130	134	138
														142

Field Name	Bit Pos	Value	Decode	Bits
-----	-----	-----	-----	----
Format Flag	25	1	Long Message	1
Protocol Flag	26	0	Location NEW	0
MID	27- 36	201	ALBANIA	0011 0010 01
Protocol Code	37- 40	7	PLB - Serial (Standard)	0111
CSTA Number	41- 50	999		1111 1001 11
Serial Number	51- 64	99		0000 0001 1000 11
Coarse Position	65- 85	DEFAULT		0111 1111 1101 1111 1111 1
BCH Encoded	86-106	Errors=0		1110 0010 0011 0110 0100 0
BCH Generated	86-106			1110 0010 0011 0110 0100 0
Long Message	107-144	Data Present		
Fixed Bits	107-109			110
Fixed Bit	110	1		1
Encode Pos Device	111	1	Internal	1
121.5 Homing	112	1	YES	1
Position Change	113-132	DEFAULT		1000 0011 1110 0000 1111
Resultant Position		-->	Not Defined	
BCH Encoded	133-144	Errors=0		0110 0110 1100



Product Service

2.5 THERMAL SHOCK

2.5.1 Equipment Under Test

Fastfind Plus PLB, Serial Number: 800-000001

2.5.2 Date of Test and Modification State

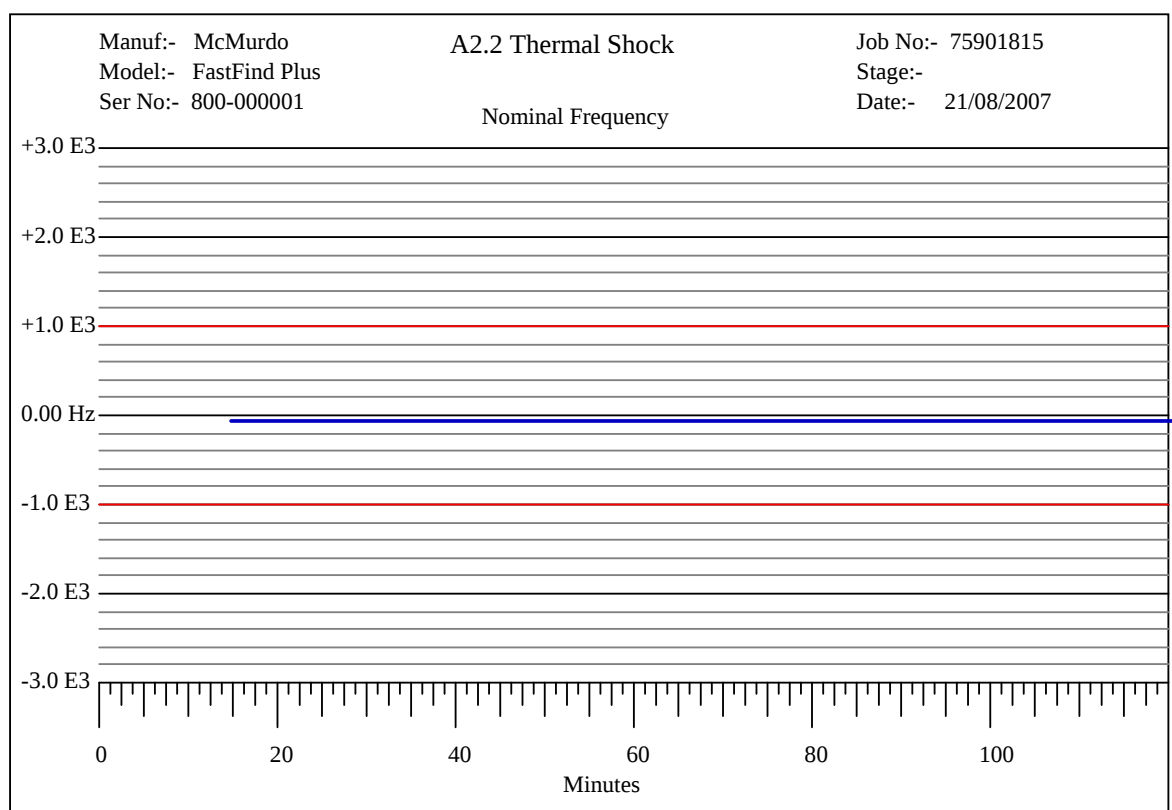
21st August 2007, Modification State 0

2.5.3 Test Equipment Used

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

2.5.4 Test Results

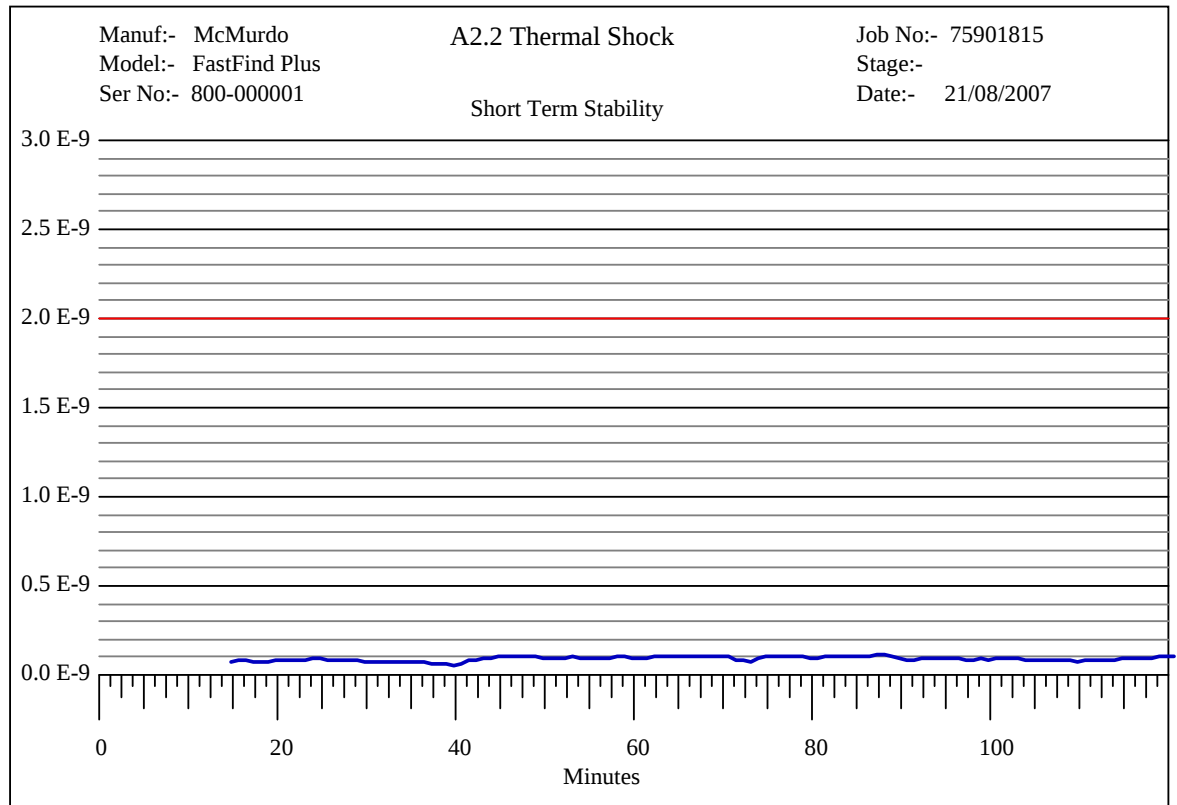
Thermal Shock – Nominal Frequency





Product Service

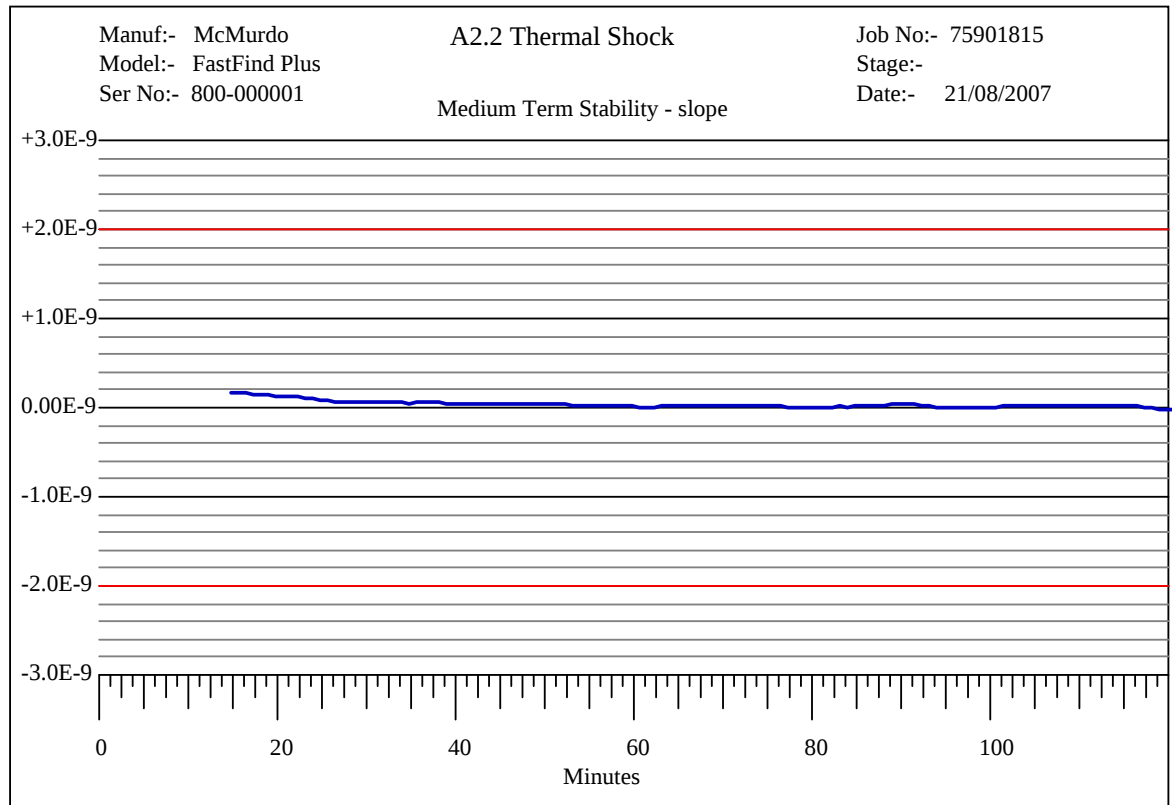
Thermal Shock – Short Term Stability





Product Service

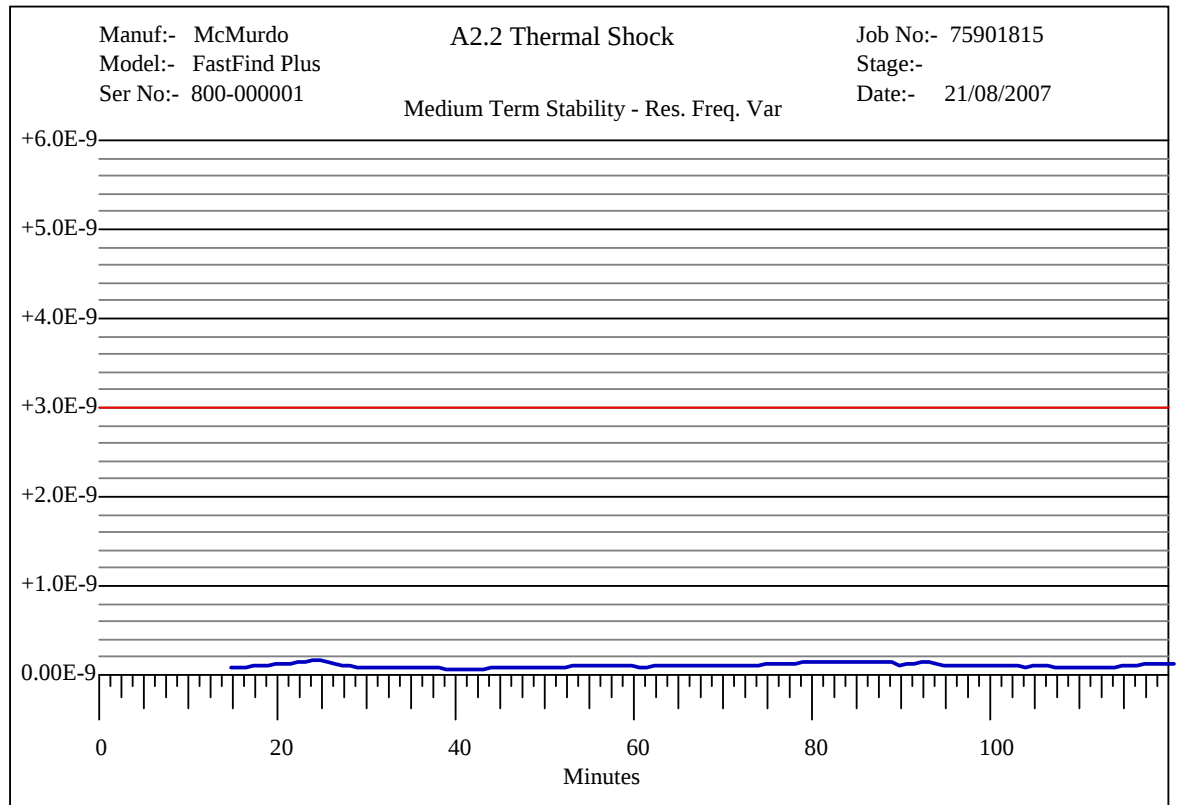
Thermal Shock – Mean Term Stability, Mean Slope





Product Service

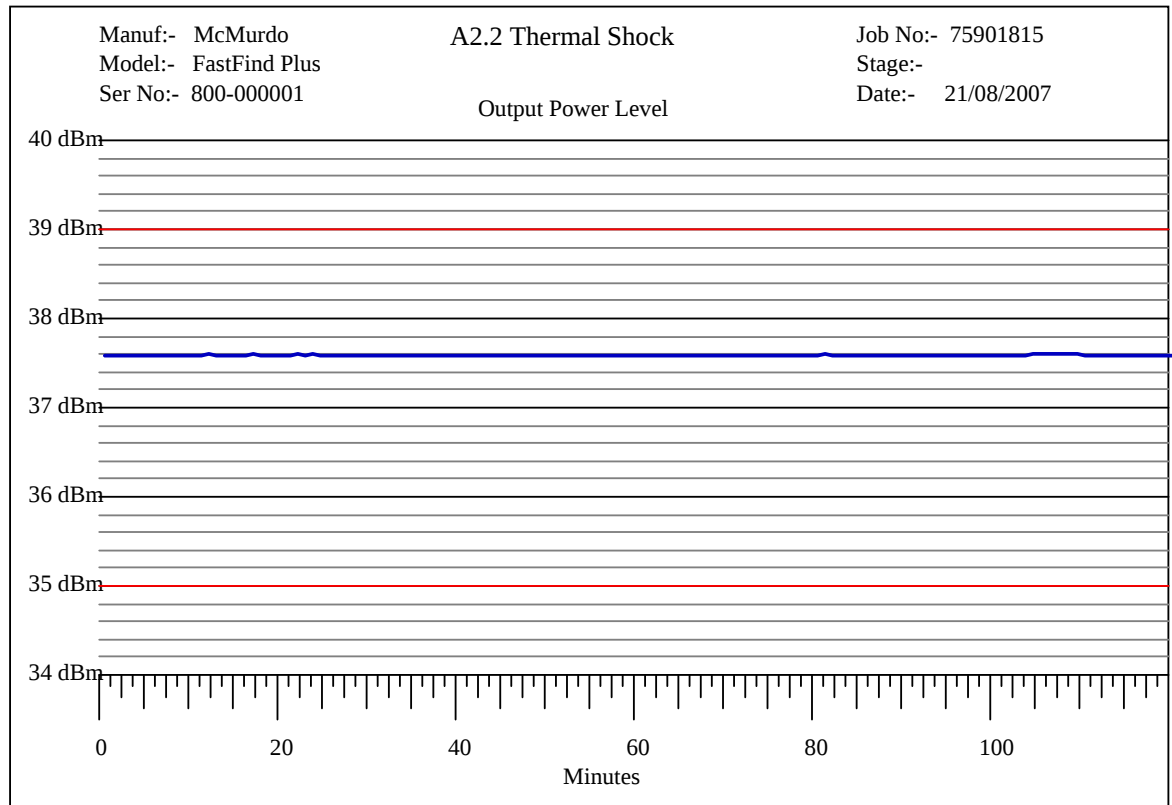
Thermal Shock – Medium Term Stability, Residual Frequency Variation





Product Service

Thermal Shock – Output Power





Product Service

Thermal Shock – Digital message

Beacon Id Format..... 30 Hex Id, Long Message, Bits 25-144

15 Hex (Bits 26- 85) = 192FF380C6FFBFF 192FF380C6FFBFF Default_Id

36 Hex (Bits 25-144) = FFE2F8C97F9C0637FDFFF11B23783E0F66C

26	30	34	38	42	46	50	54	58	62	66	70	74	78	82
1	0001	1001	0010	1111	1111	0011	1000	0000	1100	0110	1111	1111	1011	1111
	1110	0010	0011	0110	0100	0110	1111	0000	0111	1100	0001	1110	1100	1101
														100
86	90	94	98	102	106	110	114	118	122	126	130	134	138	142

Field Name	Bit Pos	Value Decode	Bits
-----	-----	-----	----
Format Flag	25	1 Long Message	1
Protocol Flag	26	0 Location NEW	0
MID	27- 36	201 ALBANIA	0011 0010 01
Protocol Code	37- 40	7 PLB - Serial (Standard)	0111
CSTA Number	41- 50	999	1111 1001 11
Serial Number	51- 64	99	0000 0001 1000 11
Coarse Position	65- 85	DEFAULT	0111 1111 1101 1111 1111 1
BCH Encoded	86-106	Errors=0	1110 0010 0011 0110 0100 0
BCH Generated	86-106		1110 0010 0011 0110 0100 0
Long Message	107-144	Data Present	
Fixed Bits	107-109		110
Fixed Bit	110	1	1
Encode Pos Device	111	1 Internal	1
121.5 Homing	112	1 YES	1
Position Change	113-132	DEFAULT	1000 0011 1110 0000 1111
Resultant Position		--> Not Defined	
BCH Encoded	133-144	Errors=0	0110 0110 1100
BCH Generated	133-144		0110 0110 1100



Product Service

2.6 OPERATING LIFETIME AT MINIMUM TEMPERATURE

2.6.1 Equipment Under Test

Fastfind Plus PLB, Serial Number: 800-000001

2.6.2 Date of Test and Modification State

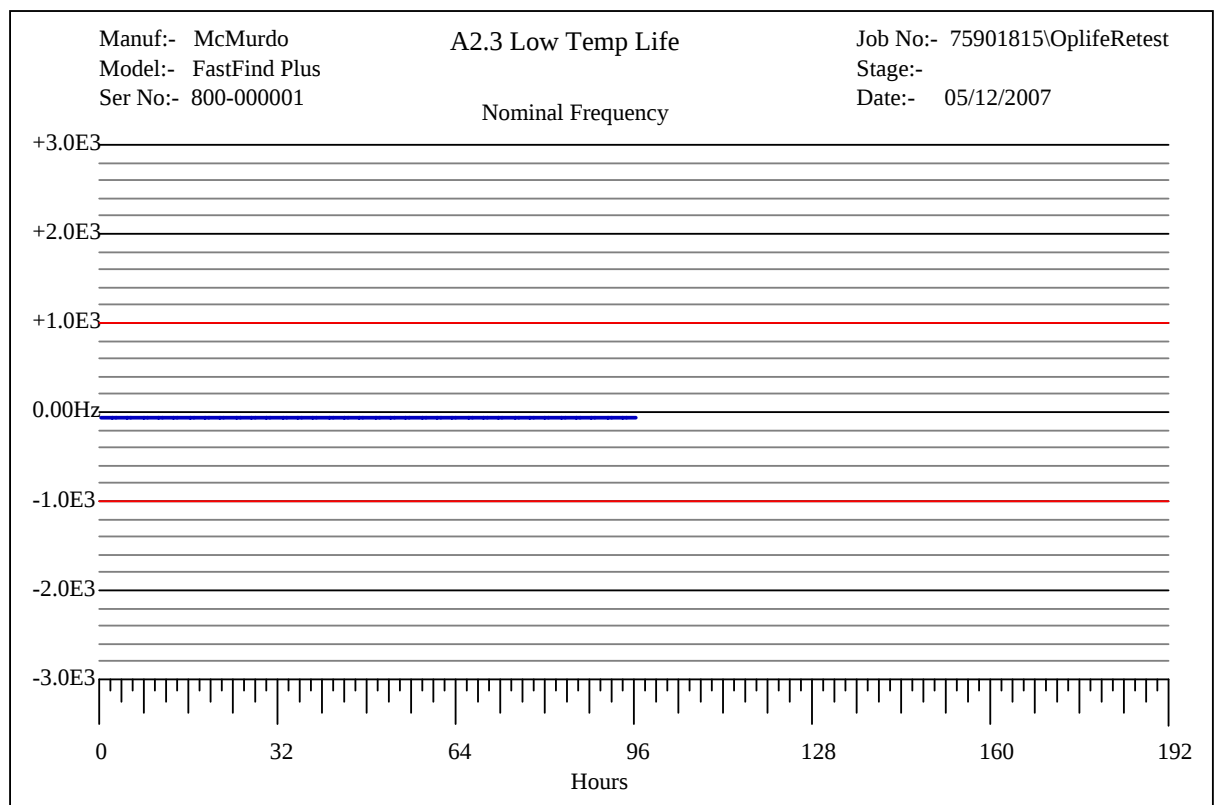
30th November 2007 to 5th December 2007, Modification State 0

2.6.3 Test Equipment Used

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

2.6.4 Test Results

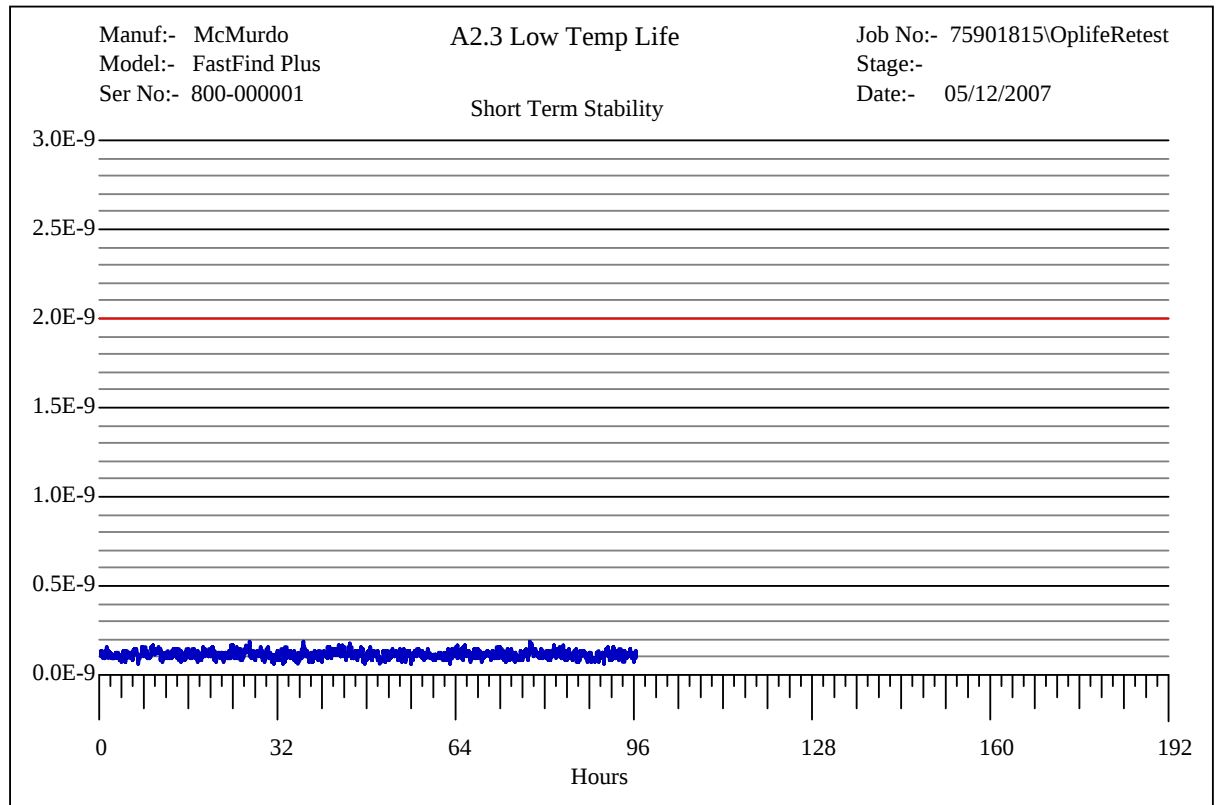
Operating Lifetime at Minimum Temperature – Nominal Frequency





Product Service

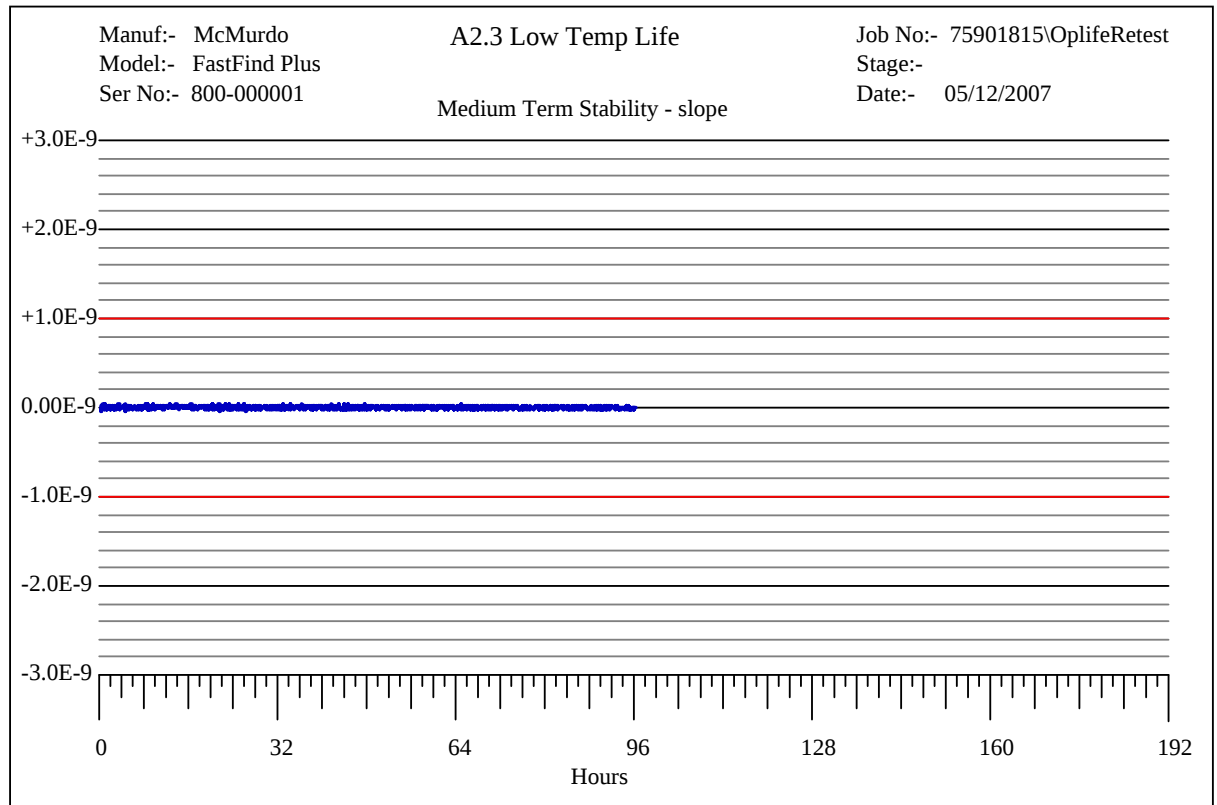
Operating Lifetime at Minimum Temperature – Short Term Stability





Product Service

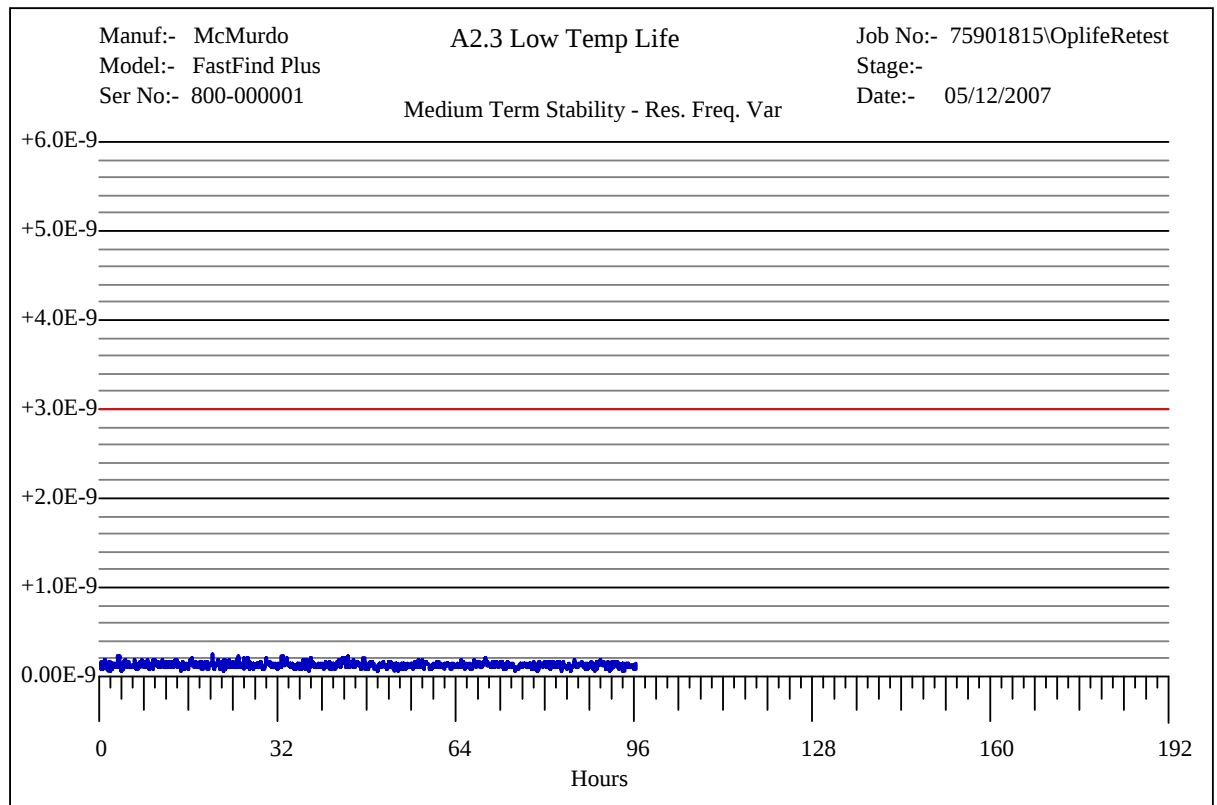
Operating Lifetime at Minimum Temperature – Medium Term Stability, Mean Slope





Product Service

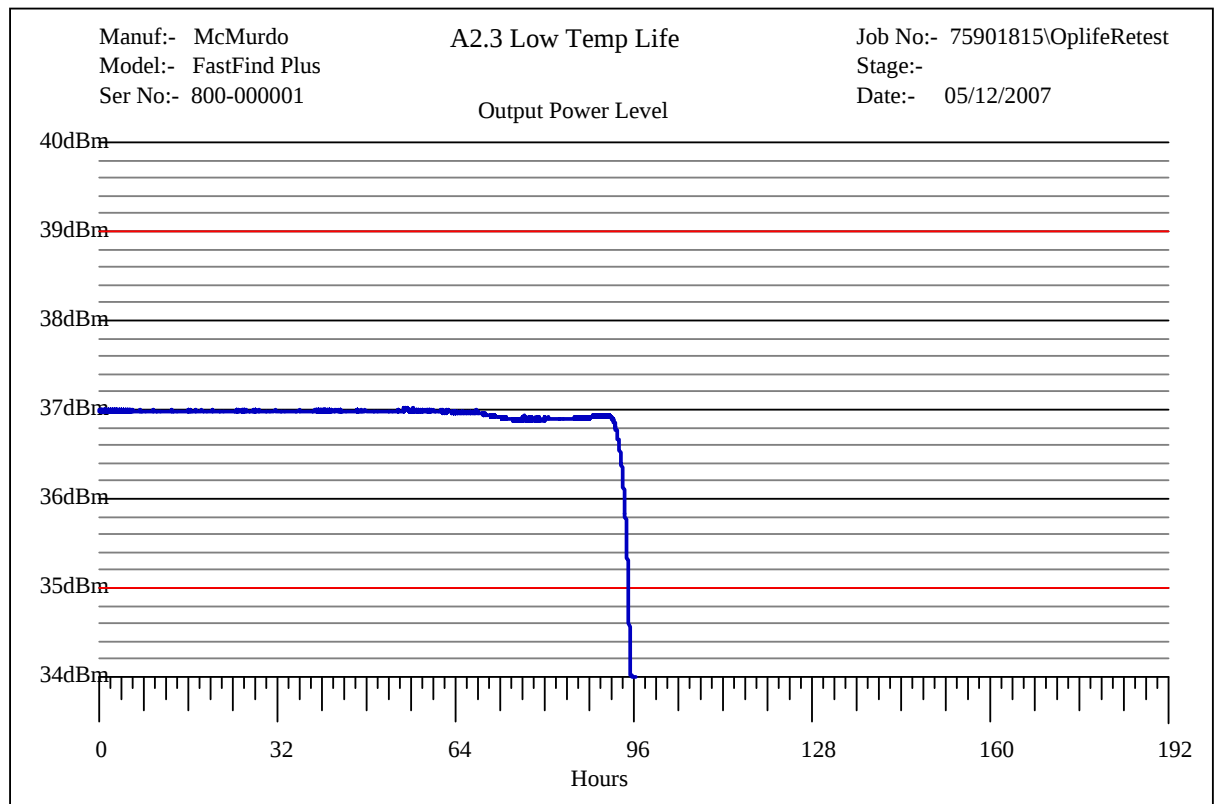
Operating Lifetime at Minimum Temperature – Medium Term Stability, Residual Frequency Variation





Product Service

Operating Lifetime at Minimum Temperature – Output Power





Product Service

Operating Lifetime at Minimum Temperature – Digital Message

Beacon Id Format..... 30 Hex Id, Long Message, Bits 25-144

15 Hex (Bits 26- 85) = 1925E847E0FFBFF 1925E847E0FFBFF Default_Id

30 Hex (Bits 25-144) = 8C92F423F07FDFFB2BF03783E0F66C

26	30	34	38	42	46	50	54	58	62	66	70	74	78	82
1	0001	1001	0010	0101	1110	1000	0100	0111	1110	0000	1111	1111	1011	1111
	0110	0101	0111	1110	0000	0110	1111	0000	0111	1100	0001	1110	1100	1101
														100
86	90	94	98	102	106	110	114	118	122	126	130	134	138	142

Field Name	Bit Pos	Value Decode	Bits
-----	-----	-----	----
Format Flag	25	1 Long Message	1
Protocol Flag	26	0 Location NEW	0
MID	27- 36	201 ALBANIA	0011 0010 01
Protocol Code	37- 40	2 EPIRB - MMSI (Standard)	0010
Ship Id	41- 60	999999	1111 0100 0010 0011 1111
Specific Beacon	61- 64	0	0000
Coarse Position	65- 85	DEFAULT	0111 1111 1101 1111 1111 1
BCH Encoded	86-106	Errors=0	0110 0101 0111 1110 0000 0
BCH Generated	86-106		0110 0101 0111 1110 0000 0
Long Message	107-144	Data Present	
Fixed Bits	107-109		110
Fixed Bit	110	1	1
Encode Pos Device	111	1 Internal	1
121.5 Homing	112	1 YES	1
Position Change	113-132	DEFAULT	1000 0011 1110 0000 1111
Resultant Position		--> Not Defined	
BCH Encoded	133-144	Errors=0	0110 0110 1100
BCH Generated	133-144		0110 0110 1100



Product Service

Battery Current Measurement Results

Battery Discharge Current

The discharge current for the batteries was measured for each of the following beacon states.

Beacon in the Off or Standby State, "Standby Current"

Beacon performing a Self-test, "Self-test Current"

Beacon activated and transmitting, "Operating Current"

The individual tests were conducted for the following durations:

Standby Current : 28.5 minutes (1711440 ms)

Self-test Current : 8.88 seconds (8880 ms)

Operating Current : 30 minutes (1799920 ms)

Assumptions / Supplied Data

Battery Replacement Interval : 6 years

Battery Capacity : 3.3 Ah

Battery Self Drain : 1.00 % per year

Self-test Interval : 12 tests per year

Test Results

Mode Current = Accumulated Charge / Time

Standby Current = $129350091 \text{ pC} / 1711440 \text{ ms} = 75.58 \text{ nA}$

Self-test Current = $915176.8 \text{ uC} / 8880 \text{ ms} = 103.06 \text{ mA}$

Operating Current = $80804696 \text{ uC} / 1799920 \text{ ms} = 44.89 \text{ mA}$

Battery Preconditioning / Discharge Time Calculations

$$\begin{aligned} \text{Battery Self Drain} &= \text{Capacity} - [(100\% - \text{Self Drain/Year}\%)^{\text{Replacement Interval}} \times \text{Capacity}] \\ &= 3.3 - ((1 - 0.0100)^6 \times 3.3) = 0.1931 \text{ Ah} \end{aligned}$$

$$\begin{aligned} \text{Standby Drain} &= \text{Hours per year} \times \text{Battery Replacement Interval} \times \text{Standby Current} \\ &= 365 \times 24 \times 6 \times 75.58 \times 10^{-9} = 0.0040 \text{ Ah} \end{aligned}$$

$$\text{Worst Case} = 1.65 \times 0.0040 \text{ Ah} = 0.0066 \text{ Ah}$$

$$\begin{aligned} \text{Self-test Drain} &= \text{Self-tests per battery} \times \text{Self-test Current} \times \text{Self-test duration (in hours)} \\ &= 12 \times 6 \times 103.06 \times 10^{-3} \times (8.88 / 3600) = 0.0183 \text{ Ah} \end{aligned}$$

$$\text{Worst Case} = 1.65 \times 0.0183 \text{ Ah} = 0.0302 \text{ Ah}$$

$$\begin{aligned} \text{Total Drain} &= \text{Self Drain} + \text{Standby Drain (Worst Case)} + \text{Self-test Drain (Worst Case)} \\ &= 0.1931 + 0.0066 + 0.0302 = 0.2299 \text{ Ah} \end{aligned}$$

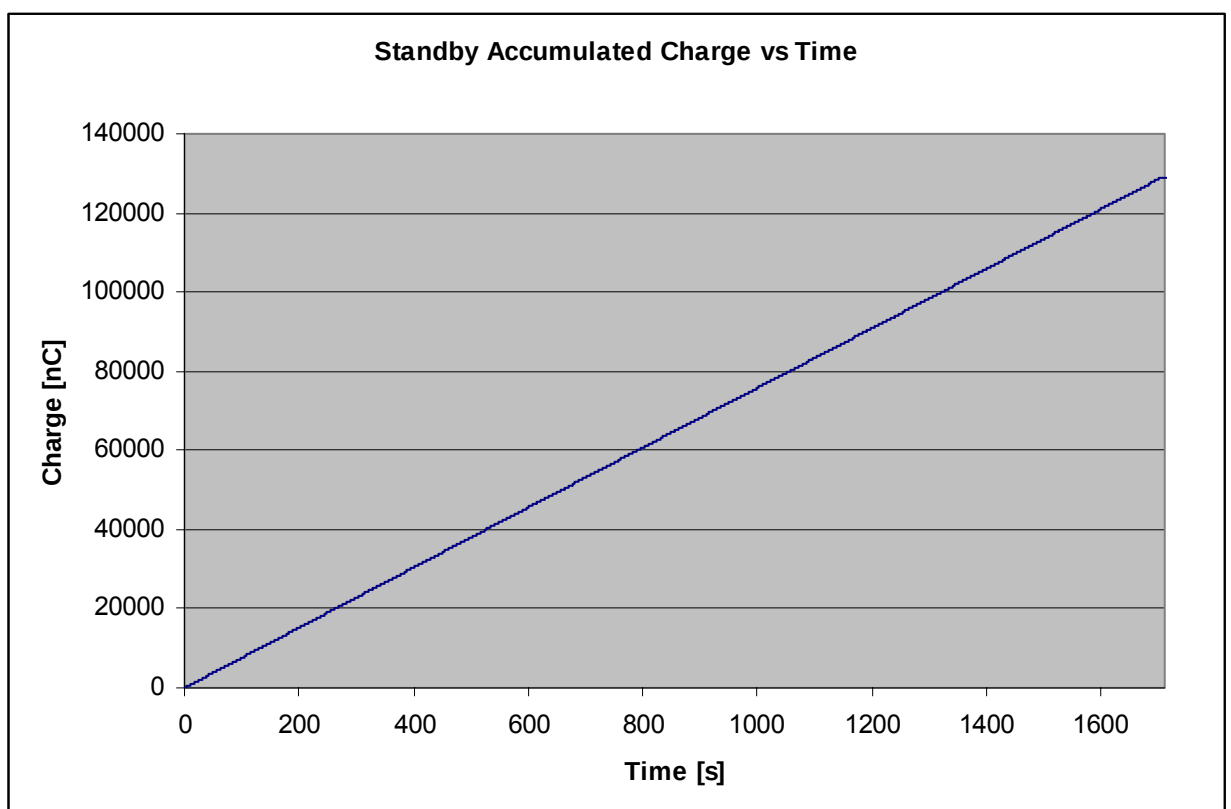
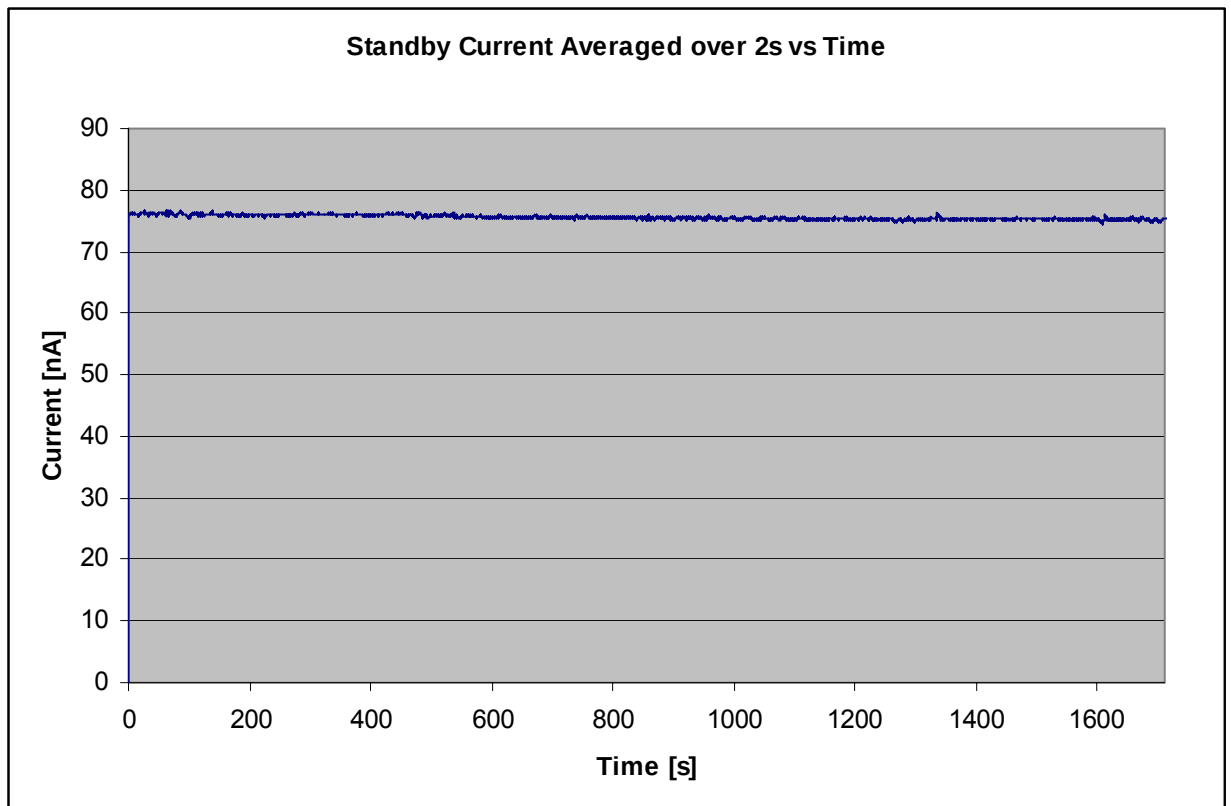
$$\begin{aligned} \text{Battery Preconditioning / Discharge Time} &= \text{Worst Case drain} / \text{Operational Current} \\ &= 0.2299 / (44.89 \times 10^{-3}) \\ &= \underline{5.12 \text{ hours}} \end{aligned}$$

Note: Using customer supplied information about the GPS duty cycle the figure of 5.12 hours has been increased to 5.74 hours, the beacon was not discharged prior to the test, hence, the 'Operational Lifetime Duration' is the 'Time Before First Failure' less this figure. The result is shown in the Test Results Table.



Product Service

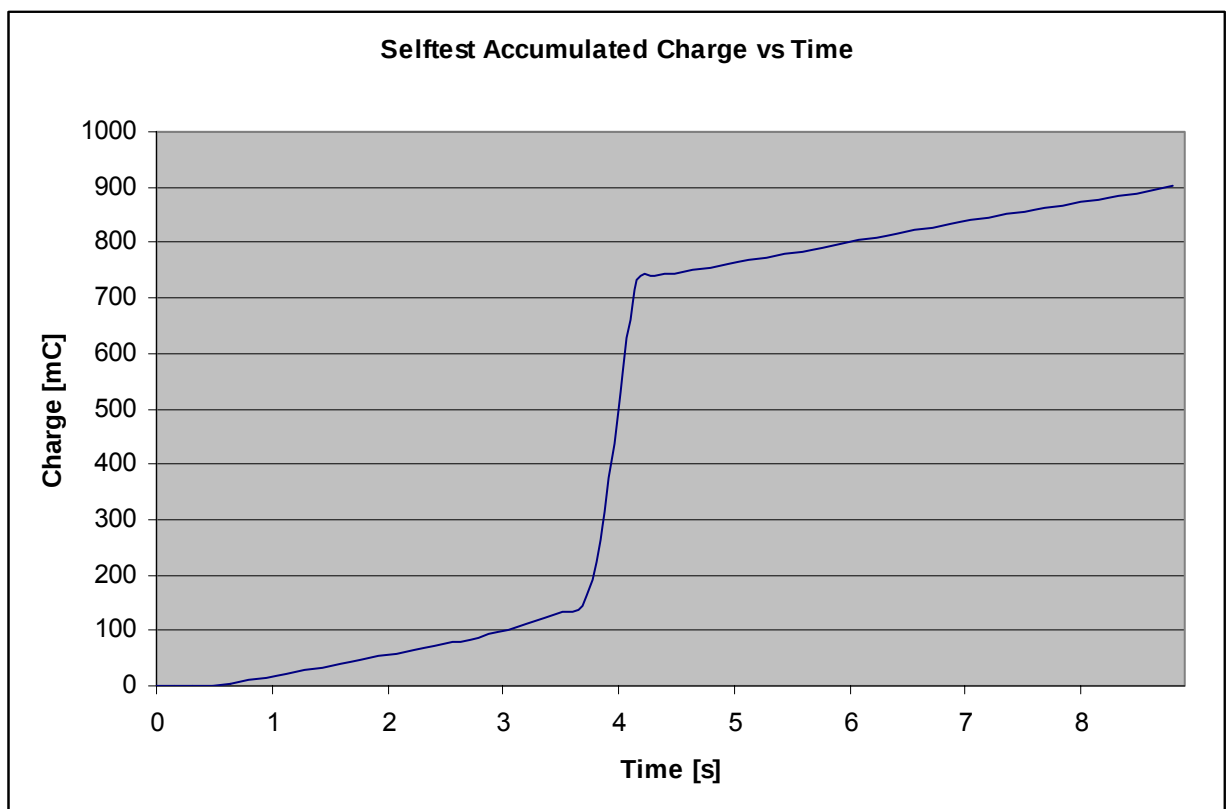
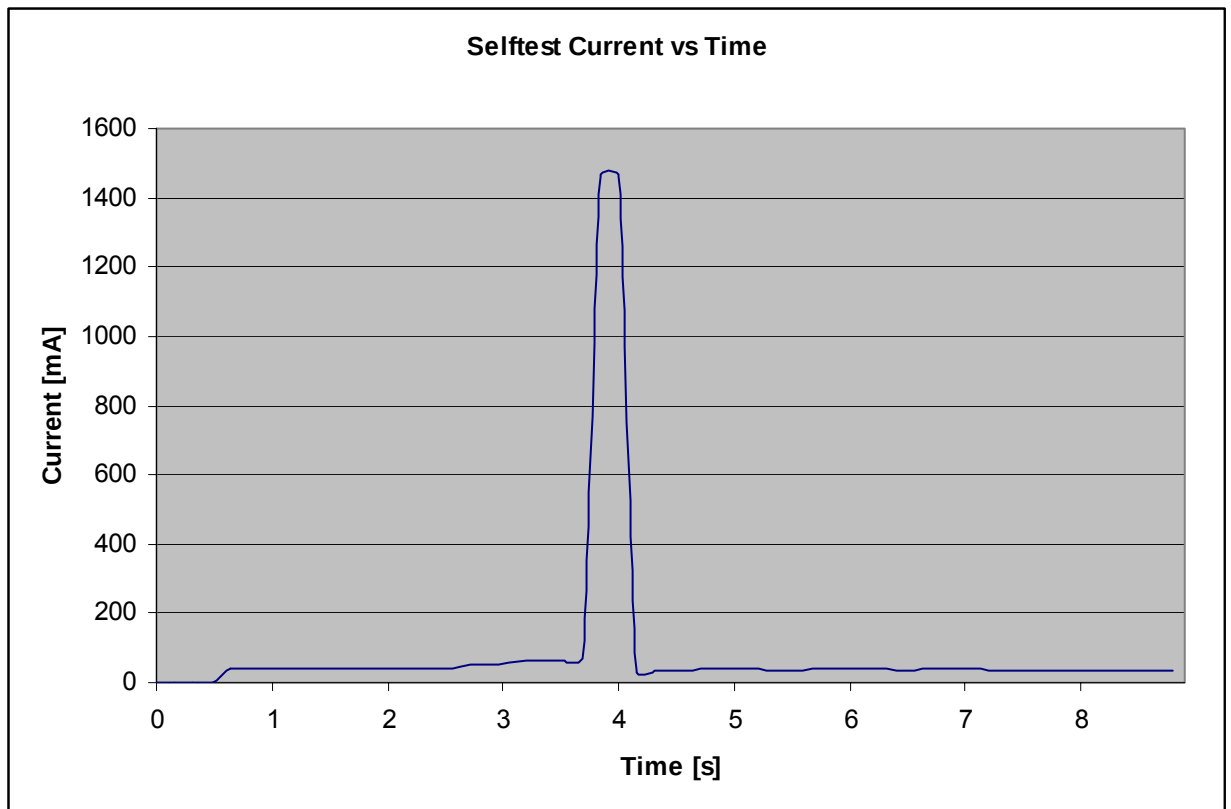
Standby Mode





Product Service

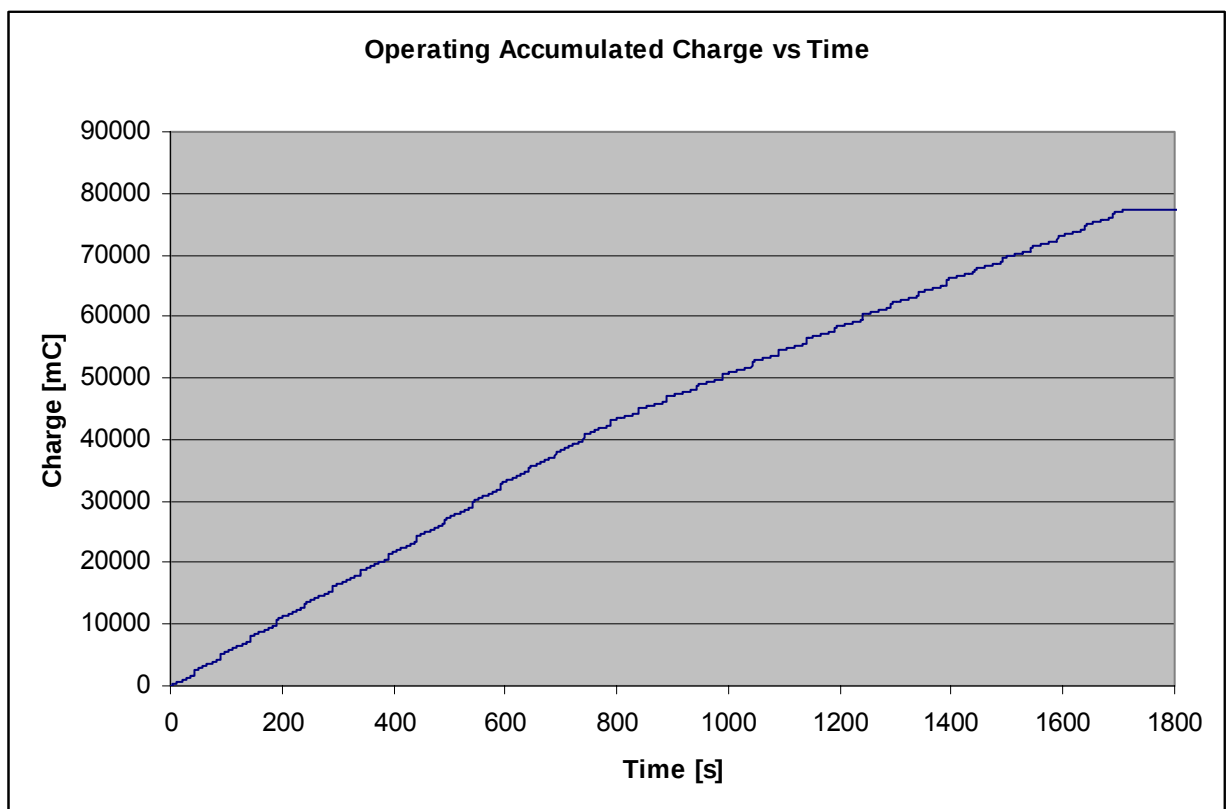
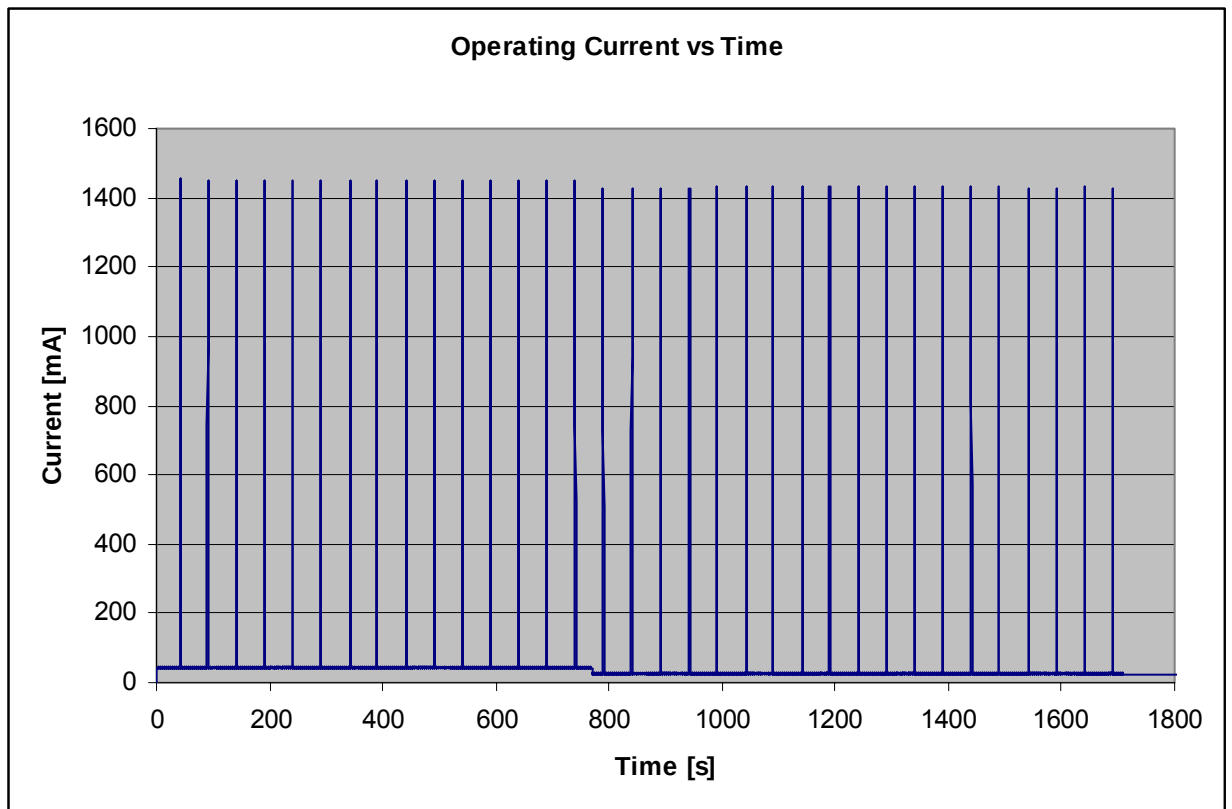
Selftest Mode





Product Service

Operational Mode





Product Service

2.7 FREQUENCY STABILITY WITH TEMPERATURE GRADIENT

2.7.1 Equipment Under Test

Fastfind Plus PLB, Serial Number: 800-000001

2.7.2 Date of Test and Modification State

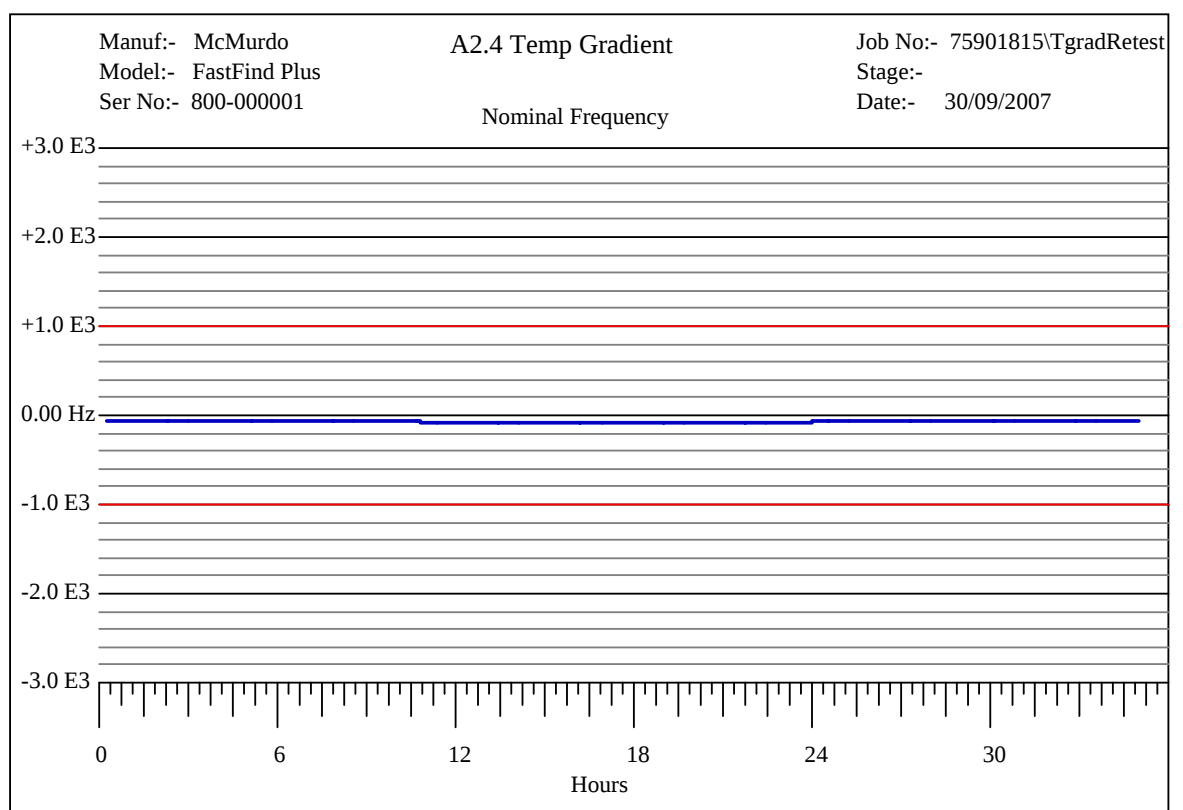
30th September 2007, Modification State 1

2.7.3 Test Equipment Used

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

2.7.4 Test Results

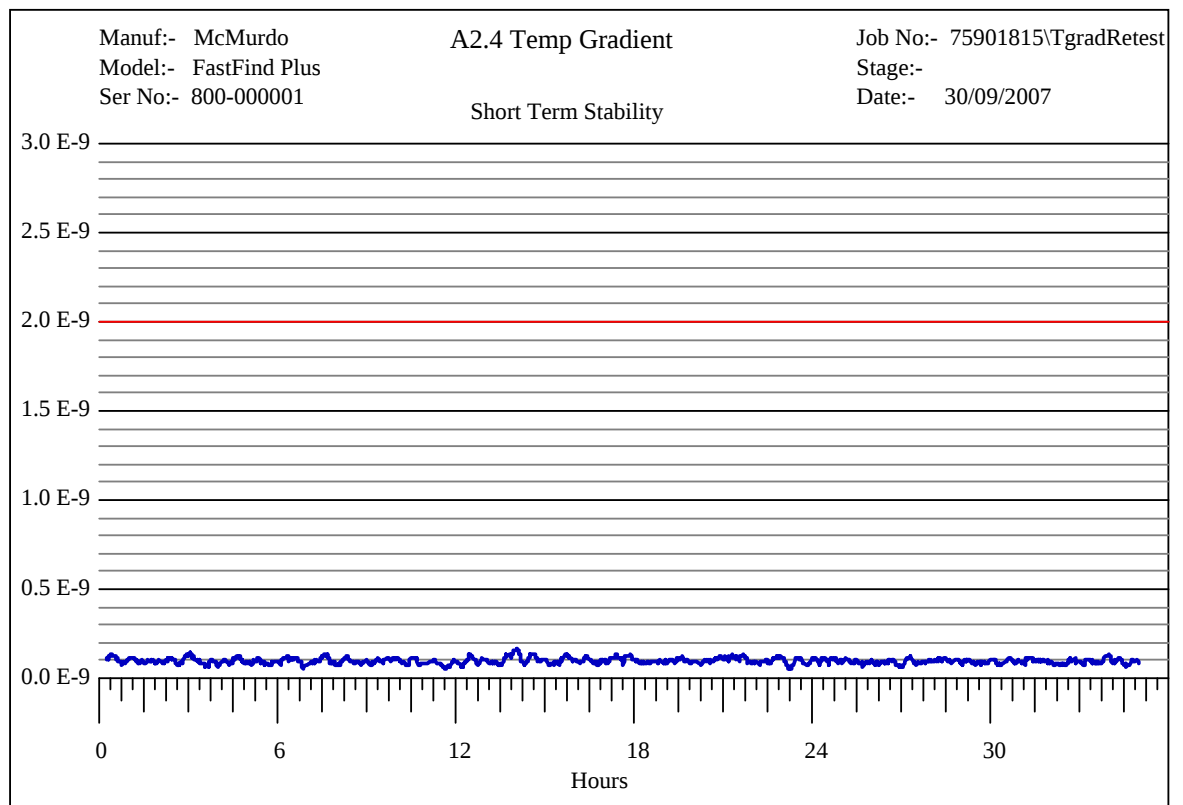
Temperature Gradient – Nominal Frequency





Product Service

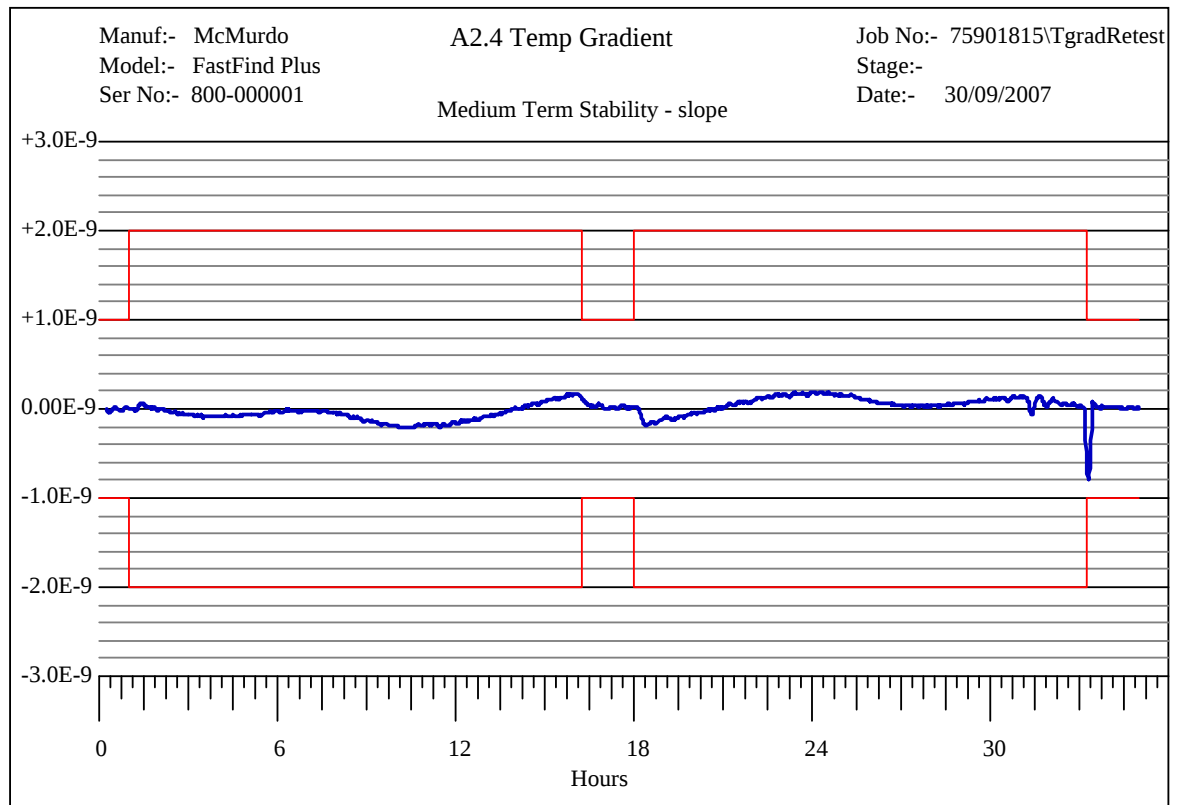
Temperature Gradient – Short Term Stability





Product Service

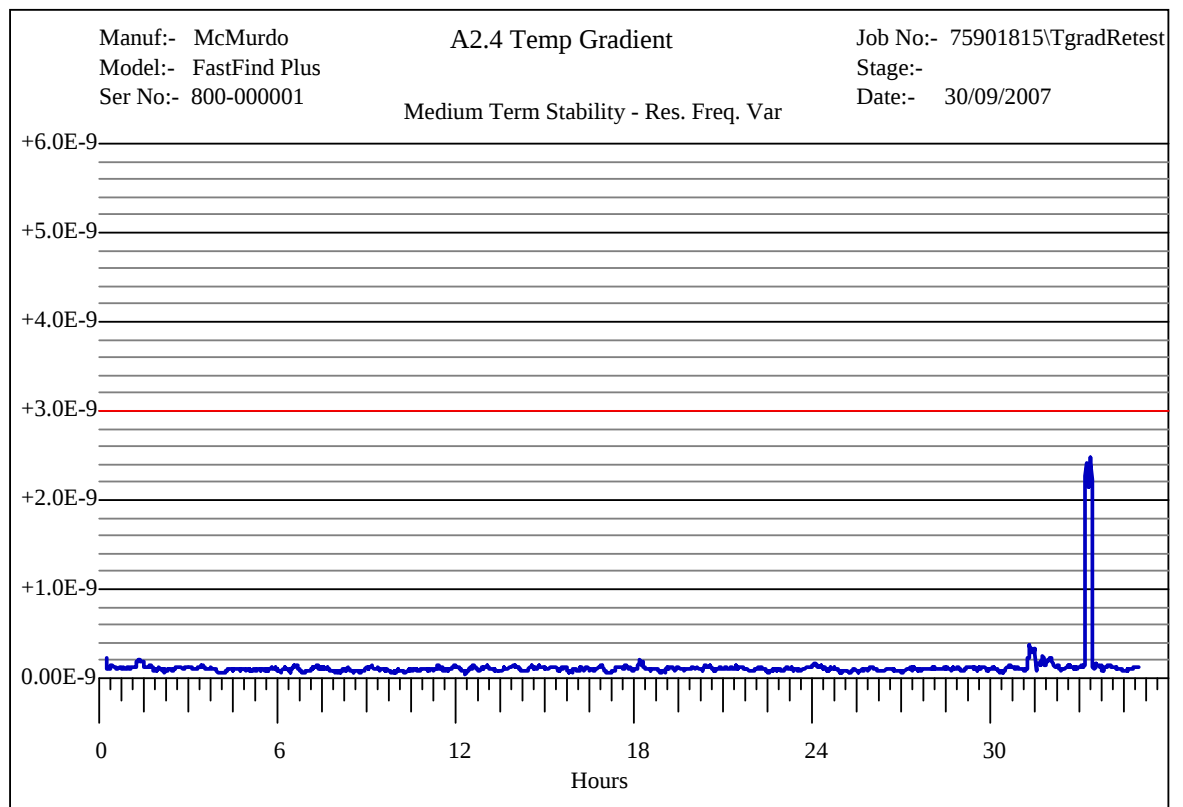
Temperature Gradient – Medium Term Stability, Mean Slope





Product Service

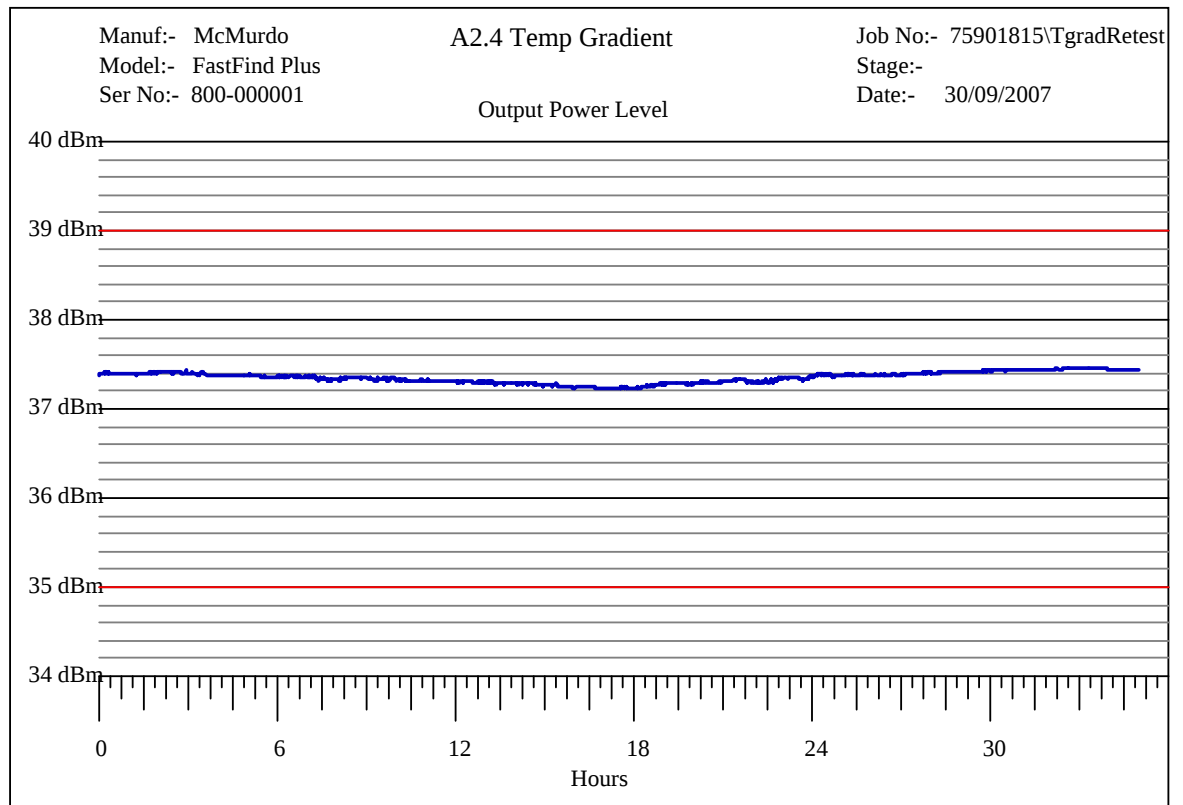
Temperature Gradient – Medium Term Stability, Residual Frequency Variation





Product Service

Temperature Gradient – Output Power





Product Service

Temperature Gradient – Digital Message

Beacon Id Format..... 30 Hex Id, Long Message, Bits 25-144

15 Hex (Bits 26- 85) = 193DF380C6FFBFF 193DF380C6FFBFF Default_Id

36 Hex (Bits 25-144) = FFFE2F8C9EF9C0637FDFF83D15B783E0F66C

26	30	34	38	42	46	50	54	58	62	66	70	74	78	82
1	0001	1001	0011	1101	1111	0011	1000	0000	1100	0110	1111	1111	1011	1111
	0000	0111	1010	0010	1011	0110	1111	0000	0111	1100	0001	1110	1100	1101
														100
86	90	94	98	102	106	110	114	118	122	126	130	134	138	142

Field Name	Bit Pos	Value Decode	Bits
-----	-----	-----	----
Format Flag	25	1 Long Message	1
Protocol Flag	26	0 Location NEW	0
MID	27- 36	201 ALBANIA	0011 0010 01
Protocol Code	37- 40	14 Test Serial (Standard)	1110
Spare	41- 64		1111 1001 1100 0000 0110 0011
Coarse Position	65- 85	DEFAULT	0111 1111 1101 1111 1111 1
BCH Encoded	86-106	Errors=0	0000 0111 1010 0010 1011 0
BCH Generated	86-106		0000 0111 1010 0010 1011 0
Long Message	107-144	Data Present	
Fixed Bits	107-109		110
Fixed Bit	110	1	1
Encode Pos Device	111	1 Internal	1
121.5 Homing	112	1 YES	1
Position Change	113-132	DEFAULT	1000 0011 1110 0000 1111
Resultant Position		--> Not Defined	
BCH Encoded	133-144	Errors=0	0110 0110 1100
BCH Generated	133-144		0110 0110 1100



Product Service

2.8 SATELLITE QUALITATIVE TESTS

2.8.1 Equipment Under Test

Table 1 – Fastfind Plus PLB, Serial Number: 800-000001,
Antenna Part/Model Number: 85-710B

Table 2 – Fastfind Plus PLB, Serial Number: 800-000001,
Antenna Part/Model Number: 85-710B

2.8.2 Date of Test and Modification State

Table 1 – 12th September 2007, 09:00 to 22:00, Modification State 1

Table 2 – 17th and 18th September 2007, 11:00 to 15:00, Modification State 1

2.8.3 Test Equipment Used

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

2.8.4 Test Results

Table 1

Beacon 15 Hex ID: 193E0 031BF 81FE0
Actual location of the test beacon: Latitude: 050° 49.091'N
Longitude: 001° 11.870'W
Beacon test configuration
(e.g. on dry ground floating in water etc) : Resting on Dry Ground

Satellite ID	Satellite Pass Number	15 Hex ID Provided by LUT	Doppler Latitude	Doppler Longitude	Mean Rx Power (dBm)	TCA	CTA (deg)	Location Error (km)
S9	27118	193E0 031BF 81FE0	50.82622	-1.20755	-124.53	19:20:04	18.084	1.124
S11	4660	193E0 031BF 81FE0	50.82205	-1.21088	-121.56	18:33:23	19.360	1.012
S7	48516	193E0 031BF 81FE0	50.83013	-1.18859	-124.97	18:15:58	-15.567	1.478
S8	35945	193E0 031BF 81FE0	50.82421	-1.18888	-123.02	16:26:27	-8.647	0.918
S7	48514	193E0 031BF 81FE0	50.84264	-1.13875	-122.47	14:56:09	14.554	4.958
S8	35944	193E0 031BF 81FE0	50.82657	-1.20690	-123.22	14:45:42	6.816	1.129
S8	35943	193E0 031BF 81FE0	50.82187	-1.20716	-121.56	13:06:21	19.821	0.772
S10	11917	193E0 031BF 81FE0	50.82210	-1.20019	-124.40	13:11:49	-2.137	0.466
S9	27114	193E0 031BF 81FE0	50.81620	-1.19539	-124.89	12:51:45	16.818	0.279
S11	4656	193E0 031BF 81FE0	50.81855	-1.19377	-120.90	12:04:22	15.144	0.288
S10	11916	193E0 031BF 81FE0	50.82478	-1.20327	-124.38	11:31:30	12.616	0.827
S9	27113	193E0 031BF 81FE0	50.81435	-1.18609	-122.59	11:12:45	2.958	0.928
S9	27112	193E0 031BF 81FE0	50.81446	-1.19445	-118.87	09:32:21	-12.753	0.477
S11	4654	193E0 031BF 81FE0	50.81640	-1.19337	-115.34	08:44:17	-14.903	0.371
S7	48510	193E0 031BF 81FE0	50.82739	-1.16560	-126.77	08:27:56	20.192	2.483

$$\begin{aligned}
 \text{Ratio of successful solutions} &= \frac{\text{number of Doppler solution within 5km with } 1^\circ < \text{CTA} < 21^\circ}{\text{number of satellite passes over test duration with } 1^\circ < \text{CTA} < 21^\circ} \\
 &= \frac{15}{15} = 100.0\%
 \end{aligned}$$



Product Service

Table 2

Beacon 15 Hex ID: 193E0 031BF 81FE0
Actual location of the test beacon: Latitude: 052° 14.447'N
Longitude: 001° 43.970'W

Beacon test configuration
(e.g. on dry ground floating in water etc) : C/S T.007 Figure B.5

Satellite ID	Satellite Pass Number	15 Hex ID Provided by LUT	Doppler Latitude	Doppler Longitude	Mean Rx Power (dBm)	TCA	CTA (deg)	Location Error (km)
S10	12000	193E0 031BF 81FE0	52.24414	-1.73214	-126.01	10:30:29	19.426	0.376
S9	27198	193E0 031BF 81FE0	52.23757	-1.72594	-124.91	10:33:47	-3.573	0.589
S7	48595	193E0 031BF 81FE0	52.20279	-1.71246	-128.47	07:45:19	13.954	4.444
S8	36024	193E0 031BF 81FE0	52.24049	-1.72101	-130.71	07:04:23	15.990	0.805
S8	36023	193E0 031BF 81FE0	52.23931	-1.72486	-118.79	05:24:37	2.622	0.567
S7	48593	193E0 031BF 81FE0	52.23835	-1.72148	-120.74	04:25:27	-15.276	0.819
S10	11996	193E0 031BF 81FE0	52.24069	-1.72349	-127.92	03:58:00	12.400	0.636
S8	36022	193E0 031BF 81FE0	52.23624	-1.72154	-126.71	03:43:27	-12.678	0.919
S10	11995	193E0 031BF 81FE0	52.24024	-1.73385	-123.96	02:17:42	-1.811	0.092
S10	11994	193E0 031BF 81FE0	52.23382	-1.72264	-128.96	00:35:57	-17.356	1.039
S9	27191	193E0 031BF 81FE0	52.24456	-1.71925	-119.04	22:23:57	-8.446	1.015
S9	27190	193E0 031BF 81FE0	52.24897	-1.72873	-126.01	20:43:54	6.471	0.952
S9	27189	193E0 031BF 81FE0	52.24453	-1.73058	-125.39	19:05:13	19.062	0.444
S7	48587	193E0 031BF 81FE0	52.23878	-1.74416	-127.08	17:56:52	-12.199	0.802
S8	36016	193E0 031BF 81FE0	52.24440	-1.71784	-129.35	17:09:17	-14.894	1.097
S7	48586	193E0 031BF 81FE0	52.27233	-1.71065	-124.24	16:16:32	2.968	3.817
S7	48585	193E0 031BF 81FE0	52.24764	-1.72942	-122.15	14:37:33	16.319	0.797
S8	36014	193E0 031BF 81FE0	52.24678	-1.72794	-120.26	13:47:57	14.290	0.745
S10	11988	193E0 031BF 81FE0	52.24755	-1.71950	-121.55	14:01:20	-9.662	1.178
S9	27185	193E0 031BF 81FE0	52.24129	-1.72046	-125.73	12:36:13	13.782	0.844
S10	11987	193E0 031BF 81FE0	52.24987	-1.73062	-123.18	12:20:19	5.461	1.021
S10	11986	193E0 031BF 81FE0	52.24596	-1.73156	-126.77	10:40:41	18.310	0.582

$$\begin{aligned}
 \text{Ratio of successful solutions} &= \frac{\text{number of Doppler solution within 5km with } 1^\circ < \text{CTA} < 21^\circ}{\text{number of satellite passes over test duration with } 1^\circ < \text{CTA} < 21^\circ} \\
 &= \frac{22}{22} = 100.0\%
 \end{aligned}$$



Product Service

2.9 ANTENNA CHARACTERISTICS

2.9.1 Equipment Under Test

Fastfind Plus PLB, Serial Number: 800-000001

2.9.2 Date of Test and Modification State

Table 1 - 18th September 2007, Modification State 1

Table 2 - 17th September 2007, Modification State 1

2.9.3 Test Equipment Used

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

2.9.4 Test Results

Table 1 – Configuration as per T.007 Figure B.5

Azimuth Angle (degrees)	Elevation Angle (degrees)									
	10		20		30		40		50	
	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi
0	39.0	1.44	40.4	2.81	37.2	-0.35	35.3	-2.29	30.2	-7.41
90	38.9	1.37	40.2	2.63	37.6	0.03	35.5	-2.02	29.6	-7.94
180	40.2	2.61	41.4	3.84	39.5	1.89	38.5	0.93	36.8	-0.72
270	39.5	1.98	40.7	3.15	38.8	1.21	37.7	0.12	36.0	-1.58

$$\text{EIRP}_{\text{LOSS}} = \text{Pt}_{\text{amb}} - \text{Pt}_{\text{EOL}} = (37.56 - 37.036) = 0.524 \text{ dB}$$

$$\text{EIRP}_{\text{maxEOL}} = \text{MAX} [\text{EIRP}_{\text{max}}, (\text{EIRP}_{\text{max}} - \text{EIRP}_{\text{LOSS}})] = \text{MAX} (41.4, 40.876) = 41.4 \text{ dBm}$$

$$\text{EIRP}_{\text{minEOL}} = \text{MIN} [\text{EIRP}_{\text{min}}, (\text{EIRP}_{\text{min}} - \text{EIRP}_{\text{LOSS}})] = \text{MIN} (35.3, 34.776) = 34.776 \text{ dBm}$$

Pt_{amb} is the power at ambient from the summary table

Pt_{EOL} is the power at the end of Operating Life at Minimum Temperature

EIRP_{max} is the maximum EIRP from the antenna characteristics spreadsheet

EIRP_{min} is the minimum EIRP from the antenna characteristics spreadsheet

Table 2 – Configuration as per T.007 Figure B.2

Azimuth Angle (degrees)	Elevation Angle (degrees)									
	10		20		30		40		50	
	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi
0	39.5	1.90	42.0	4.44	42.8	5.22	37.9	0.34	33.4	-4.20
30	39.6	2.07	41.7	4.12	42.5	4.92	38.0	0.42	32.7	-4.90
60	39.7	2.10	41.7	4.16	42.8	5.19	38.4	0.85	32.2	-5.39
90	39.7	2.09	41.6	4.06	43.0	5.40	38.7	1.13	32.5	-5.07
120	39.9	2.31	42.1	4.55	42.9	5.31	38.4	0.85	33.0	-4.54
150	40.0	2.41	42.1	4.55	43.1	5.52	38.3	0.77	34.1	-3.50
180	39.5	1.91	42.0	4.45	42.9	5.31	37.9	0.30	34.9	-2.70
210	39.6	2.00	42.0	4.45	42.9	5.29	37.8	0.21	35.3	-2.26
240	40.0	2.39	42.1	4.56	42.5	4.98	37.5	-0.03	35.6	-1.96
270	39.9	2.38	42.2	4.67	42.6	4.99	37.7	0.09	35.5	-2.05
300	39.6	2.07	42.2	4.62	42.6	5.04	37.7	0.13	35.0	-2.57
330	39.5	1.89	41.6	4.04	42.5	4.94	37.8	0.23	34.6	-2.93
Gain Variation	0.52		0.63		0.60		1.17		3.42	

Azimuth Angle (degrees)	Elevation Angle (degrees)									
	10		20		30		40		50	
	Vv	Vh	Vv	Vh	Vv	Vh	Vv	Vh	Vv	Vh
0	111.00	92.20	113.10	96.30	113.20	95.20	107.00	95.80	100.20	94.60
30	111.20	90.20	112.80	95.20	112.90	94.70	107.30	91.00	100.10	90.50
60	111.20	92.70	112.90	88.70	113.20	92.00	107.80	85.60	99.90	85.80
90	111.20	92.00	112.80	87.40	113.40	93.30	107.90	94.90	99.90	90.60
120	111.40	93.60	113.30	82.00	113.30	94.30	107.50	96.50	100.00	93.70
150	111.50	93.50	113.30	85.60	113.50	95.30	107.20	98.50	100.50	96.50
180	111.00	93.20	113.20	85.20	113.30	94.10	106.80	97.50	101.80	95.70
210	111.10	92.30	113.20	79.60	113.30	91.90	106.90	95.20	102.70	93.50
240	111.50	92.40	113.30	88.60	113.00	90.00	106.90	87.10	103.40	86.60
270	111.50	91.00	113.40	91.30	113.00	91.60	107.00	89.20	103.20	90.00
300	111.20	90.20	113.30	95.30	113.00	95.80	106.90	93.80	102.40	93.10
330	111.00	91.60	112.70	96.10	112.90	95.70	106.90	95.50	101.70	94.90
Min (Vv-Vhh)	17.80		16.60		17.20		8.70		4.00	

$$EIRP_{LOSS} = P_{t_{amb}} - P_{t_{EOL}} = (37.56 - 37.036) = 0.524 \text{ dB}$$

$$EIRP_{maxEOL} = \text{MAX} [EIRP_{max}, (EIRP_{max} - EIRP_{LOSS})] = \text{MAX} (43.0, 42.476) = 43.0 \text{ dBm}$$

$$EIRP_{minEOL} = \text{MIN} [EIRP_{min}, (EIRP_{min} - EIRP_{LOSS})] = \text{MIN} (34.1, 33.576) = 33.576 \text{ dBm}$$

$P_{t_{amb}}$ is the power at ambient from the summary table

$P_{t_{EOL}}$ is the power at the end of Operating Life at Minimum Temperature

$EIRP_{max}$ is the maximum EIRP from the antenna characteristics spreadsheet

$EIRP_{min}$ is the minimum EIRP from the antenna characteristics spreadsheet



Product Service

2.10 BEACON CODING SOFTWARE

2.10.1 Equipment Under Test

Fastfind Plus PLB, Serial Number: 800-000001

2.10.2 Date of Test and Modification State

11th October 2007, Modification State 1

2.10.3 Test Equipment Used

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

2.10.4 Test Results

Examples of User Protocol Beacon Messages

Protocol	Operational Message (in hexadecimal including bit and frame synchronisation bits)	Self-Test Message (in hexadecimal including bit and frame synchronisation bits)
Maritime User Protocol with MMSI	FFFE2FCC94186186186689DE52 AFE0FF0146	FFFED0CC94186186186689DE52 AFE0FF0146
Maritime User Protocol with Radio Call Sign	FFFE2FCC9526F6F06B268F9F32 2FE0FF0146	FFFED0CC9526F6F06B268F9F32 2FE0FF0146
Radio Call Sign User Protocol	FFFE2FCC9DBDBC1A55468ED9F6 2FE0FF0146	FFFED0CC9DBDBC1A55468ED9F6 2FE0FF0146
Serial User: Float Free EPIRB with Serial Number	N/A	N/A
Serial User: Non Float Free EPIRB with Serial Number	FFFE2FCC972000C6007CEB7FB1 6FE0FF0146	FFFED0CC972000C6007CEB7FB1 6FE0FF0146
Aviation User Protocol	N/A	N/A
Serial User: ELT with Serial Number	N/A	N/A
Serial User: ELT with Aircraft Operator Designator & Serial Number	N/A	N/A
Serial User: ELT with Aircraft 24-bit address	N/A	N/A
Serial User: PLB with Serial Number	FFFE2FCC97A000C6007CE83E1F EFE0FF0146	FFFED0CC97A000C6007CE83E1F EFE0FF0146
National User (Short)	N/A	N/A
National User (Long)	N/A	N/A



Product Service

Protocol	Operational Message (in hexadecimal including bit and frame synchronisation bits)		Self-Test Message (in hexadecimal including bit and frame synchronisation bits)
	Location A	Location B	
Standard Location: EPIRB with MMSI	FFFE2F8C92F423F033A03DDC83F71DA4D4D0	FFFE2F8C92F423F032E0320822F78EE7647B	FFFED08C92F423F07FDFFB2BF03783E0F66C
Standard Location: EPIRB with Serial Number	FFFE2F8C96F9C06333A03F659CF71DA4D4D0	FFFE2F8C96F9C06332E030B13DF78EA76951	FFFED08C96F9C0637FDF F992EF3783E0F66C
Standard Location: ELT with 24-bit Address	N/A	N/A	N/A
Standard Location: ELT with Serial Number	N/A	N/A	N/A
Standard Location: ELT with Aircraft Operator Designator	N/A	N/A	N/A
Standard Location: PLB with Serial Number	FFFE2F8C97F9C06333A039E6C1F71C65DA00	FFFE2F8C97F9C06332E0363260F78EA76951	FFFED08C97F9C0637FDF F11B23783E0F66C
National Location: EPIRB	FFFE2F8C9A0018CCD701CE0ABA77920C0AB2	FFFE2F8C9A0018CCB1019BCFE5B79C200CD8	FFFED08C9A0018DFC0FF02AD44779F3C0010
National Location: ELT	N/A	N/A	N/A
National Location: PLB	FFFE2F8C9B0018CCD701C889E777920C0AB2	FFFE2F8C9B0018CCB1019D4CB8B794240FCD	FFFED08C9B0018DFC0FF042E19779F3C0010
User Location	FFFE2FCC97A000C6007CE83E1FE66D01C026	FFFE2FCC97A000C6007CE83E1FE65901967F	FFFED0CC97A000C6007CE83E1FEFE0FF0146



Product Service

2.11 NAVIGATION SYSTEM – NATIONAL LOCATION PROTOCOL

2.11.1 Equipment Under Test

Fastfind Plus PLB, Serial Number: 800-000001

2.11.2 Date of Test and Modification State

25th September 2007, Modification State 1

2.11.3 Test Equipment Used

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

2.11.4 Test Results

Position Data Default Values

The beacon was activated without providing data and operated for 30 minutes. Message content was checked for all bursts during this period.

Hex 30 Message	Message Count
8C9B0018DFC0FF042E19779F3C0010	34

Position Acquisition Time and Position Accuracy

Resting On Dry Ground A3.8.2.1: Location: 50° 52.163'N, 1° 14.605'W①

Resting On Dry Ground A3.8.2.2: Location: 51° 22.583'N, 1° 49.833'W①

B5 Configuration A3.8.2.1: Location: 50° 52.135'N, 1° 14.701'W

B5 Configuration A3.8.2.2: Location: 51° 22.583'N, 1° 49.833'W

Operation Configuration	C/S T.007 Section A3.8.2.1		C/S T.007 Section A3.8.2.2	
	Time to Acquire Position (sec)	Location Error in metres	Time to Acquire Position (sec)	Location Error in metres
Resting on Dry Ground	121	68.6	121	49.2
B.5	120	193.7	121	49.2

Positional accuracy was estimated using the Haversine Formula, earths radius taken as 6367km.

Encoded Position Data Update Interval

Location 50° 48.683'N, 1° 37.417'W ^①		
Time from activation to 1 st message	121s	
First Message Acquired at	14:54:37	8C9B0018CCB1019D4CB8B7922408CC
Data Acquired at	14:54:37	8C9B0018CCB1019D4CB8B7922408CC
Location 51° 22.583'N, 1° 49.833'W ^①		
First Message Acquired at	14:55:28	8C9B0018CCB1019D4CB8B7922408CC
Data Updated at	15:15:28	8C9B0018CCD701C889E777920C0AB2
Data Update Interval	20 m 51 s	

Position Clearance After Deactivation

The beacon was activated and a position acquired, moved and a new position acquired, deactivated and reactivated without providing navigation data.

Location 50° 48.683'N, 1° 37.417'W ^①		
Time from activation to 1 st message	121s	
First Message Acquired at	14:54:37	8C9B0018CCB1019D4CB8B7922408CC
Data Acquired at	14:54:37	8C9B0018CCB1019D4CB8B7922408CC
Location 51° 22.583'N, 1° 49.833'W ^①		
First Message at	14:55:28	8C9B0018CCB1019D4CB8B7922408CC
Data Updated at	15:15:28	8C9B0018CCD701C889E777920C0AB2
Deactivated at	15:18:47	
Time from re-activation to 1 st message	121s	
Default data present	15:21:00	8C9B0018DFC0FF042E19779F3C0010

Last Valid Position

Location 50° 48.683'N, 1° 37.417'W ^①		
Time from activation to 1 st message	121	
First Message Acquired at	11:49:07	8C9B0018CCB1019D4CB8B794240FCD
Data Acquired at	11:49:07	8C9B0018CCB1019D4CB8B794240FCD
GPS Signal Navigation Data Removed	11:51:47	
Last Message with Positional Data	15:47:28	8C9B0018CCB1019D4CB8B794240FCD
First Message with Default Data	15:48:18	8C9B0018DFC0FF042E19779F3C0010
Last Valid Position Held	236 m	

① Input navigation simulator.

Coarse Position and Delta Offset

Script Reference (See table D.3 of C/S T.007 – Issue 4 November 2005)	Value of Encoded Location Bits Transmitted by Beacon (Hexadecimal)	Confirmation that BCH Correct (✓)
1	Bits 59-85 = 3F81FE0 Bits 113-126 = 27CF	✓
2	Bits 59-85 = A8A0C2 Bits 113-126 = 2489 Number of seconds after providing navigation data that beacon transmitted the above encoded location information: 51	✓
3	Bits 59-85 = A8A0C2 Bits 113-126 = 3F09	✓
4	Bits 59-85 = D8A0C2 Bits 113-126 = 2189	✓
5	Bits 59-85 = D8A0C2 Bits 113-126 = B09	✓
6	Bits 59-85 = C8B67D Bits 113-126 = 749	✓
7	Bits 59-85 = C8B67D Bits 113-126 = 77E	✓
8	Bits 59-85 = C8967C Bits 113-126 = 702	✓
9	Bits 59-85 = C8967C Bits 113-126 = 77E	✓
10	Bits 59-85 = C8B67D Bits 113-126 = 749	✓

Input from navigation simulator.



Product Service

2.12 NAVIGATION SYSTEM – STANDARD LOCATION PROTOCOL

2.12.1 Equipment Under Test

Fastfind Plus PLB, Serial No. 800-000001

2.12.2 Date of Test and Modification State

7th September 2007, Modification State 1

2.12.3 Test Equipment Used

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

2.12.4 Test Results

Position Data Default Values

The beacon was activated without providing data and operated for 30 minutes. Message content was checked for all bursts during this period.

Hex 30 Message	Message Count
8C97F9C0637FDFFF11B23783E0F66C	34

Position Acquisition Time and Position Accuracy

Resting On Dry Ground A3.8.2.1: Location: 50° 52.163'N, 1° 14.605'W①

Resting On Dry Ground A3.8.2.2: Location: 51° 22.583'N, 1° 49.833'W①

B5 Configuration A3.8.2.1: Location: 50° 52.135'N, 1° 14.701'W

B5 Configuration A3.8.2.2: Location: 51° 22.583'N, 1° 49.833'W

Operation Configuration	C/S T.007 Section A3.8.2.1		C/S T.007 Section A3.8.2.2	
	Time to Acquire Position (sec)	Location Error in metres	Time to Acquire Position (sec)	Location Error in metres
Resting on Dry Ground	121	55.3	121	52.9
B.5	121	40.2	121	49.8

Positional accuracy was estimated using the Haversine Formula, earths radius taken as 6367km.

Encoded Position Data Update Interval

Location 50° 48.683'N, 1° 37.417'W ^①		
Time from activation to 1 st message	121s	
First Message Acquired at	15:02:53	8C97F9C06332E03F8418378E473967
Data Acquired at	15:02:53	8C97F9C06332E03F8418378E473967
Location 51° 22.583'N, 1° 49.833'W ^①		
First Message Acquired at	15:23:45	8C97F9C06333A039E6C1F71DA4D4D0
Data Updated at	15:23:45	8C97F9C06333A039E6C1F71DA4D4D0
Data Update Interval	20m 52 s	

Position Clearance After Deactivation

The beacon was activated and a position acquired, moved and a new position acquired, deactivated and reactivated without providing navigation data.

Location 51° 22.583'N, 1° 49.833'W ^①		
Time from activation to 1 st message	121	
First Message Acquired at	11:35:09	8C97F9C06333A039E6C1F71DA4D4D0
Data Acquired at	11:35:09	8C97F9C06333A039E6C1F71DA4D4D0
Location 50° 48.683'N, 1° 37.417'W ^①		
First Message at	11:56:00	8C97F9C06332E0363260F78EA76951
Data Updated at	11:56:00	8C97F9C06332E0363260F78EA76951
Deactivated at	11:58:45	
Time from re-activation to 1 st message	121	
Default data present	12:00:56	8C97F9C0637FDFFF11B23783E0F66C

Last Valid Position

Location 50° 48.683'N, 1° 37.417'W ^①		
Time from activation to 1 st message	121sec	
First Message Acquired at	09:51:27	8C97F9C06332E0363260F78EA76951
Data Acquired at	09:51:27	8C97F9C06332E0363260F78EA76951
GPS Signal Navigation Data Removed	09:51:47	
Last Message with Positional Data	13:48:51	8C97F9C06332E0363260F78EA76951
First Message with Default Data	13:49:41	8C97F9C0637FDFFF11B23783E0F66C
Last Valid Position Held	238m	

① Input navigation simulator.

Coarse Position and Delta Offset

Script Reference (See table D.3 of C/S T.007 – Issue 4 November 2005)	Value of Encoded Location Bits Transmitted by Beacon (Hexadecimal)	Confirmation that BCH Correct (✓)
1	Bits 65-85 = FFBFF Bits 113-132 = 83E0F	✓
2	Bits 65-85 = 2404 Bits 113-132 = 8E227 Number of seconds after providing navigation data that beacon transmitted the above encoded location information: 53	✓
3	Bits 65-85 = 2404 Bits 113-132 = F8227	✓
4	Bits 65-85 = 3404 Bits 113-132 = 88227	✓
5	Bits 65-85 = 3404 Bits 113-132 = 74627	✓
6	Bits 65-85 = 2404 Bits 113-132 = 8227	✓
7	Bits 65-85 = 2404 Bits 113-132 = 83D7	✓
8	Bits 65-85 = 2406 Bits 113-132 = 8227	✓
9	Bits 65-85 = 2406 Bits 113-132 = 81B8	✓
10	Bits 65-85 = 2402 Bits 113-132 = 8206	✓

Input navigation simulator.



Product Service

2.13 NAVIGATION SYSTEM – USER LOCATION PROTOCOL

2.13.1 Equipment Under Test

Fastfind Plus PLB, Serial Number: 800-000001

2.13.2 Date of Test and Modification State

2nd October 2007, Modification State 1

2.13.3 Test Equipment Used

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

2.13.4 Test Results

Position Data Default Values

The beacon was activated without providing data and operated for 30 minutes. Message content was checked for all bursts during this period.

Hex 30 Message	Message Count
CC97A000C6007CE83E1FEFE0FF0146	34

Position Acquisition Time and Position Accuracy

Resting On Dry Ground A3.8.2.1: Location: 50° 52.163'N, 1° 14.605'W①
Resting On Dry Ground A3.8.2.2: Location: 51° 22.583'N, 1° 49.833'W①

B5 Configuration A3.8.2.1: Location: 50° 52.135'N, 1° 14.701'W
B5 Configuration A3.8.2.2: Location: 51° 22.583'N, 1° 49.833'W

Operation Configuration	C/S T.007 Section A3.8.2.1		C/S T.007 Section A3.8.2.2	
	Time to Acquire Position (sec)	Location Error in metres	Time to Acquire Position (sec)	Location Error in metres
Resting on Dry Ground	121	1658.3	121	3372.7
B.5	121	1538.8	121	3372.7

Positional accuracy was estimated using the Haversine Formula, earths radius taken as 6367km.

Encoded Position Data Update Interval

Location 50° 48.683'N, 1° 37.417'W ^①		
Time from activation to 1 st message	121s	
First Message Acquired at	10:01:50	CC97A000C6007CE83E1FE65901967F
Data Acquired at	10:01:50	CC97A000C6007CE83E1FE65901967F
Location 51° 22.583'N, 1° 49.833'W ^①		
First Message Acquired at	10:02:40	CC97A000C6007CE83E1FE65901967F
Data Updated at	10:22:42	CC97A000C6007CE83E1FE66D01C026
Data Update Interval	20 m 52 s	

Position Clearance After Deactivation

The beacon was activated and a position acquired, moved and a new position acquired, deactivated and reactivated without providing navigation data.

Location 50° 48.683'N, 1° 37.417'W ^①		
Time from activation to 1 st message	121s	
First Message Acquired at	10:01:50	CC97A000C6007CE83E1FE65901967F
Data Acquired at	10:01:50	CC97A000C6007CE83E1FE65901967F
Location 51° 22.583'N, 1° 49.833'W ^①		
First Message at	10:02:40	CC97A000C6007CE83E1FE65901967F
Data Updated at	10:22:42	CC97A000C6007CE83E1FE66D01C026
Deactivated at	10:23:28	
Time from re-activation to 1 st message	121s	
Default data present	10:25:36	CC97A000C6007CE83E1FEFE0FF0146

Last Valid Position

Location 50° 48.683'N, 1° 37.417'W ^①		
Time from activation to 1 st message	121 s	
First Message Acquired at	12:31:11	CC97A000C6007CE83E1FE65901967F
Data Acquired at	12:31:11	CC97A000C6007CE83E1FE65901967F
GPS Signal Navigation Data Removed	12:31:26	
Last Message with Positional Data	16:30:23	CC97A000C6007CE83E1FE65901967F
First Message with Default Data	16:31:11	CC97A000C6007CE83E1FEFE0FF0146
Last Valid Position Held	240 m	

① Input navigation simulator.



Product Service

Coarse Position and Delta Offset

Script Reference (See table D.3 of C/S T.007 – Issue 4 November 2005)	Value of Encoded Location Bits Transmitted by Beacon (Hexadecimal)	Confirmation that BCH Correct (✓)
1	Bits 108-132 = FE0FF0	✓
2	Bits 108-132 = 230111 Number of seconds after providing navigation data that beacon transmitted the above encoded location information: 51	✓
3	Bits 108-132 = 6D052	✓

Input navigation simulator.



Product Service

SECTION 3

TEST EQUIPMENT USED



Product Service

3.1 TEST EQUIPMENT

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

Instrument	Manufacturer	Type No	TE Number	Calibration Due
Section 2.9 - Antenna Characteristics				
Spectrum Analyser	Hewlett Packard	8568B	571	4-Jan-2008
Signal Generator	Rohde & Schwarz	SMS-2/28	1431	2-May-2008
Antenna Mast	EMCO	1050	1707	TU
Turntable Controller	Various	RH253	1708	TU
Open Area Site 2	TUV	OATS2	1850	3-Oct-2008
Turntable Interface	Various	RH-253.6	1855	TU
Antenna Tower 6M	EMCO	1050	1859	TU
Roberts Antenna 406MHz	Compliance Design	-	1860	29-Jun-2009
Section 2.10 - Beacon Coding Software				
Beacon Tester	WS Technologies	BT 100S	87	TU
GPS/SBAS Simulator	Spirent	STR4500	3056	1-Feb-2008
Hygrometer	Rotronic	I-1000	3068	25-Apr-2008
EPIRB Tester	Arg Electro Design	5412	3270	TU
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3352	18-Apr-2008
Section 2.1, 2.2, 2.3, 2.4 - Constant Temperature Tests				
Climatic Chamber	Heraeus Votsch	VMT 04/30	40	O/P Mon
Power Meter	Hewlett Packard	436A	47	9-Jul-2008
Power Meter	Hewlett Packard	436A	83	11-Aug-2008
Signal Generator	Hewlett Packard	8644A	96	11-Jan-2008
Load (50ohm, 15W)	Diamond Antenna	DL-30N	337	28-Aug-2008
Load (50ohm)	Diamond	DL-30N	392	28-Aug-2008
Attenuator 10dB 25W	Weinschel	46-10-43	400	13-Apr-2008
Spectrum Analyser	Hewlett Packard	E4407B	1154	19-Jul-2008
Signal Generator	Hewlett Packard	8664A	1183	3-Aug-2008
Signal Generator	Hewlett Packard	3336C	1189	19-Jul-2008
Climatic Chamber	TAS	Micro 225	2892	15-Feb-2008
Beacon RF Unit	TUV	N/A	3066	TU
Hygrometer	Rotronic	I-1000	3068	25-Apr-2008
Termination (50ohm, 6W)	Micronde	R404613	3074	24-Feb-2008
Attenuator (20dB, 75W)	Bird	8308-200	3076	26-Feb-2008
Termination (50ohm, 15W)	Diamond Antenna	DL-30N	3098	16-Mar-2008
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3160	30-May-2008
Attenuator (3dB, 20W)	Aeroflex / Weinschel	23-3-34	3162	19-Jun-2008
Attenuator (3dB, 20W)	Aeroflex / Weinschel	23-3-34	3163	30-May-2008



Product Service

Instrument	Manufacturer	Type No	TE Number	Calibration Due
Section 2.1, 2.2, 2.3, 2.4 - Constant Temperature Tests				
Thermocouple Thermometer	Fluke	51	3172	18-Jun-2008
Bandpass filter	Trilithic	5BE406/35-1-AA	3206	28-Jul-2008
Bandpass Filter	Trilithic	5BE406/35-1-AA	3207	18-Sep-2008
Time Interval Analyser	Yokogawa	TA720 704510	3253	4-Oct-2007
Scope Corder	Yokogawa	DL750 701210	3254	9-Oct-2007
RF Short Circuit	TUV	Short Circuit	3268	TU
Power Sensor	Agilent	8482A	3289	15-Nov-2007
Power Sensor	Agilent	8482A	3290	14-Nov-2007
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3353	18-Apr-2008
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3354	18-Apr-2008
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3355	18-Apr-2008
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3356	18-Apr-2008
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3357	18-Apr-2008
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3359	18-Apr-2008
Section 2.11 - Navigation System				
Beacon Tester	WS Technologies	BT 100S	87	TU
GPS/SBAS Simulator	Spirent	STR4500	3056	1-Feb-2008
Hygrometer	Rotronic	I-1000	3068	25-Apr-2008
EPIRB Tester	Arg Electro Design	5412	3270	TU
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3352	18-Apr-2008



Product Service

Instrument	Manufacturer	Type No	TE Number	Calibration Due
Section 2.6 Beacons - Operating Lifetime				
Power Meter	Hewlett Packard	436A	83	11-Aug-2008
Climatic Chamber	Heraeus Votsch	VM 04/100	85	O/P Mon
Rubidium Frequency Standard	Quartzlock	A10-B	92	22-Dec-2007
Attenuator 10dB/10W)	Trilithic	HFP-50N	454	19-Jul-2008
Attenuator (10dB, 10W)	Weinschel	23-10-34	470	19-Jun-2008
Beacon RF Unit	TUV	N/A	3066	TU
Hygrometer	Rotronic	I-1000	3068	25-Apr-2008
Termination (50ohm, 15W)	Diamond Antenna	DL-30N	3097	16-Mar-2008
Attenuator (3dB, 20W)	Aeroflex / Weinschel	23-3-34	3161	30-May-2008
Thermocouple Thermometer	Fluke	51	3174	18-Jun-2008
Bandpass Filter	Trilithic	5BE406/35-1-AA	3207	18-Sep-2008
Time Interval Analyser	Yokogawa	TA720 704510	3253	6-Nov-2008
Scope Corder	Yokogawa	DL750 701210	3254	6-Nov-2008
Power Sensor	Agilent	8482A	3290	26-Nov-2008
Power Divider (N) 1W	Weinschel	1506A	3344	10-Apr-2008
ESA-E Series Spectrum Analyser	Agilent	E4402B	3348	16-Apr-2008
Cable (1m, N type)	Rhophase	NPS-1601-1000-NPS	3350	18-Apr-2008
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3351	18-Apr-2008
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3356	18-Apr-2008
Bandpass Filter	Trilithic	5BE121.55/35-3-BA	3410	28-Jul-2008
Section 2.2 - Spurious Emissions				
Climatic Chamber	Heraeus Votsch	VM 04/100	85	O/P Mon
Attenuator 10dB 25W	Weinschel	46-10-43	400	13-Apr-2008
Attenuator 10dB/10W)	Trilithic	HFP-50N	454	19-Jul-2008
Temperature Chamber	Montford	2F3	467	O/P Mon
Attenuator (10dB, 10W)	Weinschel	23-10-34	470	19-Jun-2008
Attenuator: 10dB/20W	Narda	766-10	480	19-Jul-2008
Spectrum Analyser	Hewlett Packard	E4407B	1154	19-Jul-2008
GPS Frequency Standard	Rapco	GPS-804/3	1312	15-Sep-2007
Rubidium Oscillator	Rapco	GPS-805	1313	15-Sep-2007
Hygrometer	Rotronic	I-1000	2891	6-Jan-2008
Hygrometer	Rotronic	I-1000	3068	25-Apr-2008
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3160	30-May-2008
Thermocouple Thermometer	Fluke	51	3172	18-Jun-2008
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3356	18-Apr-2008



Product Service

Instrument	Manufacturer	Type No	TE Number	Calibration Due
Section 2.8 - Satellite Qualitative Test				
Open Area Site 2	TUV	OATS2	1850	3-Oct-2008
Section 2.7 - Temperature Gradient				
Power Meter	Hewlett Packard	436A	83	11-Aug-2008
Climatic Chamber	Heraeus Votsch	VM 04/100	85	O/P Mon
Rubidium Frequency Standard	Quartzlock	A10-B	92	22-Dec-2007
Signal Generator	Hewlett Packard	8644A	96	11-Jan-2008
Attenuator (10dB, 10W)	Weinschel	23-10-34	470	19-Jun-2008
Load (50ohm, 15W)	Diamond Antenna	DL-30N	822	5-Sep-2008
Signal Generator	Hewlett Packard	3336C	1189	19-Jul-2008
Stop Clock	R.S Components	RS328 061	2674	TU
Beacon RF Unit	TUV	N/A	3066	TU
Hygrometer	Rotronic	I-1000	3068	25-Apr-2008
Termination (50ohm, 6W)	Micronde	R404613	3074	24-Feb-2008
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3160	30-May-2008
Attenuator (3dB, 20W)	Aeroflex / Weinschel	23-3-34	3161	30-May-2008
Thermocouple Thermometer	Fluke	51	3172	18-Jun-2008
Bandpass Filter	Trilithic	5BE406/35-1-AA	3205	28-Jul-2008
Time Interval Analyser	Yokogawa	TA720 704510	3253	4-Oct-2007
Scope Corder	Yokogawa	DL750 701210	3254	9-Oct-2007
Power Sensor	Agilent	8482A	3290	14-Nov-2007
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3354	18-Apr-2008
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3356	18-Apr-2008
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3359	18-Apr-2008



Product Service

Instrument	Manufacturer	Type No	TE Number	Calibration Due
Section 2.5 - Thermal Shock				
Climatic Chamber	Heraeus Votsch	VMT 04/30	40	O/P Mon
Power Meter	Hewlett Packard	436A	47	9-Jul-2008
Signal Generator	Hewlett Packard	8644A	96	11-Jan-2008
Signal Generator	Hewlett Packard	3336C	1189	19-Jul-2008
Beacon RF Unit	TUV	N/A	3066	TU
Hygrometer	Rotronic	I-1000	3068	25-Apr-2008
Termination (50ohm, 6W)	Micronde	R404613	3074	24-Feb-2008
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3160	30-May-2008
Attenuator (3dB, 20W)	Aeroflex / Weinschel	23-3-34	3162	19-Jun-2008
Thermocouple Thermometer	Fluke	51	3172	18-Jun-2008
Bandpass Filter	Trilithic	5BE406/35-1-AA	3207	18-Sep-2008
Time Interval Analyser	Yokogawa	TA720 704510	3253	4-Oct-2007
Scope Corder	Yokogawa	DL750 701210	3254	9-Oct-2007
Power Sensor	Agilent	8482A	3289	15-Nov-2007
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3354	18-Apr-2008
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3356	18-Apr-2008
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3359	18-Apr-2008

TU – Traceability Unscheduled

OP MON – Output Monitored with Calibrated Equipment



Product Service

SECTION 4

PHOTOGRAPHS

4.1 PHOTOGRAPHS OF EQUIPMENT UNDER TEST (EUT)



Side View 1



Side View 2



Product Service

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



Product Service

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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Product Service

ANNEX A

APPLICANT'S DATA



Product Service

Fastfind Plus PLB **Statement on self-test**

Self-test

The FF + is a 406.037MHz PLB operating with the Cospas-Sarsat satellite system. The FF+ has a press and hold self-test facility, which operates as follows.

- a) Power up the micro-controller, the CMAC oscillator and the GPS module.
- b) Generate a burst at 121.5MHz, check the antenna RF level is above threshold.
- c) Activate the 406.037MHz PLL and check that it is locked.
- d) Generate an inverted frame 406.037MHz transmission. Check the antenna RF level is above threshold. (This also confirms the battery is capable of high current loads).
- e) Confirm the GPS receiver has output normal NMEA sentences. (do not wait for a fix).

The self-test completes within 9s. If all of the above checks prove true then the sounder will sound; and the GREEN LED will flash three times.

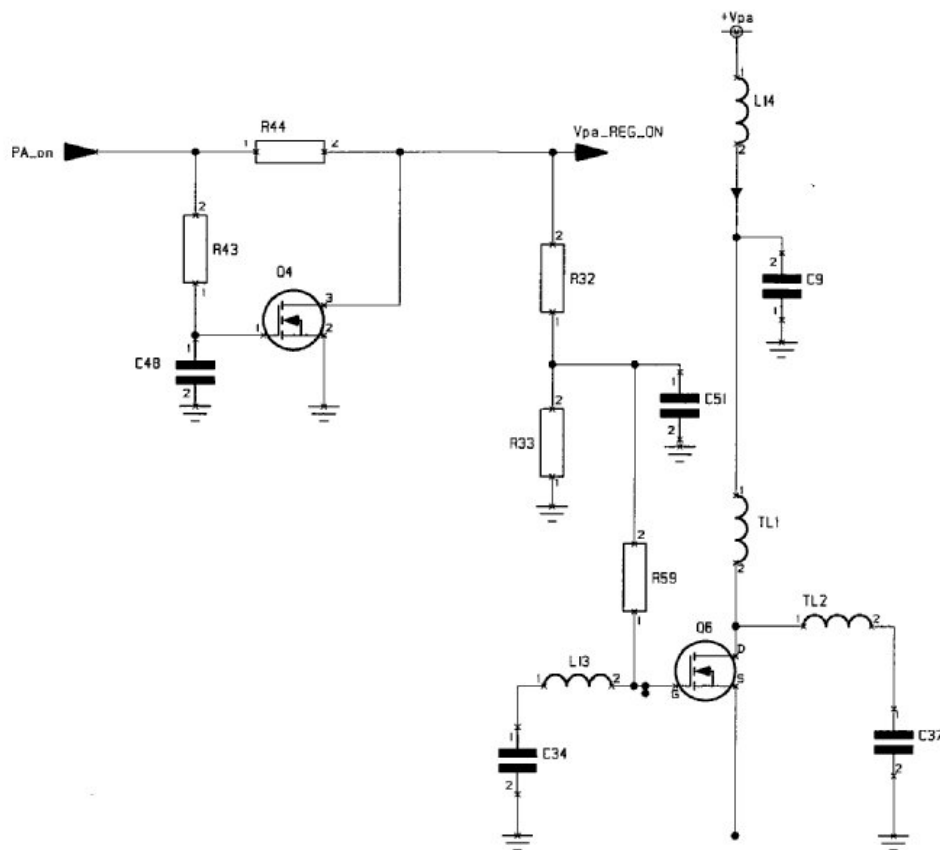
Neil Jordan
Senior Electronics Engineer
11-9-07

Protection against continuous transmission

The McMurdo Fastfind Plus PLB is designed to limit any inadvertent 406.037MHz transmission to a maximum of 3 seconds under the worst case conditions.

Figure 1 is an extract from the Fastfind Plus PLB circuit diagram 85-800C issue 1. The PA_ON line provides gate bias to the 406 PA FET Q6 via resistive network R32, R33 and R59, and also enables the PA regulator (not shown). This regulator supplies power to the drain of Q6 (Vpa).

The PA_ON line also supplies voltage to the gate of Q4 via the time constant R43 and C48. If the 406 PA is on for longer than a few seconds sufficient voltage will be developed across C48 to switch Q4 on. This will result in all the PA_ON voltage being dropped across R44 and therefore removing the DC gate bias to Q6 and the shutting down the PA regulator (Vpa).



Neil Jordan
Senior Electronics Engineer
11-9-07



Product Service

Statement on protection against beacon degradation due to internal navigation device failure

The internal GPS navigation device is a TIM-4P 12-channel module made by uBlox in Switzerland.

Software protection:

The positional data is sent from the GPS module in serial NMEA format. This data is checked for validity by examining the message field quality bit and calculated HDOP (Horizontal dilution of precision) figure. The quality bit is calculated by the GPS module to determine the quality of the position fix and requires three or more satellites with good signal to noise ratios. The HDOP figure is calculated from the relative geometry of the satellites used to determine the position fix. The smaller the figure the better the positional accuracy. The software rejects position fixes with a HDOP figure greater than 20.

With these checks in place it is considered unlikely that false position data could be encoded in the 406MHz message.

If no valid GPS data is available, the beacon will revert to transmitting default position data.

Hardware protection:

The serial NMEA data is input to the micro-controller, this input is only connected to the GPS module. If the uBlox GPS module fails in such a way as to output incorrect logic levels, then this input is protected by diodes from any excessive voltage.

The GPS module is not continuously powered in order to comply with the maximum positional update rate defined in C/S T.001. Hence in any one hour, at least 64 406MHz transmissions are made with the GPS module in-active.

The GPS module is supplied by P-channel logic level FET, which is enabled or disabled by a discrete control line from the microprocessor.

Neil Jordan

Senior Electronics Engineer

11-9-07