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Report On

RTCM Testing of the
Jotron AS
Tron 40GPS MkII and Tron 40S MkII

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Document 75900217 Report 04 Issue 2

February 2008



Product Service

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REPORT ON

Emergency Beacons Testing of the
Jotron AS
Tron 40GPS MkII and Tron 40S MkII

Document 75900217 Report 04 Issue 2

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PREPARED BY

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

R Hampton
Test Engineer

APPROVED BY

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

M Jenkins
Authorised Signatory

DATED

05 February 2008

This report has been up-issued to Issue 2 to correct typographical errors.



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SECTION 1

REPORT SUMMARY

Emergency Beacons Testing of the
Jotron AS
Tron 40GPS MkII and Tron 40S MkII



Product Service

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Emergency Beacons Testing of the Jotron AS Tron 40GPS MkII and Tron 40S MkII to the requirements of RTCM Paper 77-2002/SC110-STD.

Objective	To perform Emergency Beacons Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Jotron AS
Model Number(s)	Tron 40GPS MkII
Serial Number(s)	001 (Modified to incorporate 50Ω output) 002 003 (Tron 40S MkII, non-GPS variant) 101 (Tron 40S MkII, non-GPS variant, modified to incorporate 50Ω output)
Number of Samples Tested	Four
Additional Model Variant(s)	Tron 40S MkII
Test Specification/Issue/Date	RTCM Paper 77-2002/SC110-STD
Incoming Release Date	Application Form 02 May 2007
Order Number Date	PO0637001 02 October 2007
Start of Test	15 February 2007
Finish of Test	28 January 2008
Name of Engineer(s)	R Hampton C Hedley C Bowles A Castle K Adsetts P Kinally



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Related Document(s)	<p>MIL-STD-810D (19 July 1983), method 509.2.</p> <p>COSPAS-SARSAT C/S T.001, Specification for COSPAS-SARSAT 406 MHz Distress Beacons.</p> <p>COSPAS-SARSAT C/S T.007, COSPAS-SARSAT 406 MHz Distress Beacon Type Approval Standard.</p> <p>International Maritime Organization (IMO), Assembly Resolution A.810(19), Performance Standards for Float-Free Satellite Emergency Position-Indicating Radio Beacons (EPIRBs) Operating on 406 MHz.</p> <p>International Maritime Organization (IMO), Assembly Resolution A.662(16), Performance Standards for Float-Free Release and Activation Arrangements for Emergency Radio Equipment.</p> <p>International Maritime Organization (IMO), Assembly Resolution A.689(17), Recommendation on Testing of Life-Saving Appliances.</p> <p>U.S. Government Printing Office, U.S. Code of Federal Regulations, Title 46, Subpart 160.062, Releases. Lifesaving Equipment, Hydraulic and Manual.</p> <p>U.S. Government Printing Office, U.S. Code of Federal Regulations, Title 46, Subpart 164.018, Retroreflective Material for Lifesaving Equipment.</p> <p>Naval Publications and Forms Center (NPFC) MIL-STD-810D, method 509.2, 19 July 1983, Environmental Test Methods and Engineering Guidelines, pp.509.2-5 to 509.2-10.</p> <p>Naval Publications and Forms Center (NPFC) MIL-O-55310B, Military Specification, General Specifications for Crystal Oscillators, page 44, paragraph 4.9.34.2.1, 1 April 1987.</p>
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1.2 APPLICATION FORM

1.2.1 Beacon Manufacturer and Beacon Model

Beacon Manufacturer	Jotron AS
Beacon Model	Tron 40GPS MkII / Tron 40S MkII

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	<input checked="" type="checkbox"/>
PLB	On ground and above ground	<input type="checkbox"/>
	On ground and above ground and floating in water	<input type="checkbox"/>
ELT Survival	On ground and above ground	<input type="checkbox"/>
	On ground and above ground and floating in water	<input type="checkbox"/>
ELT Auto Fixed	Fixed ELT with aircraft external antenna	<input type="checkbox"/>
ELT Auto Portable	In aircraft with an external antenna	<input type="checkbox"/>
	On ground, above ground, or in a safety raft with an integrated antenna	<input type="checkbox"/>
ELT Auto Deployable	Deployable ELT with attached antenna	<input type="checkbox"/>
Other (specify)		<input type="checkbox"/>

1.2.3 Beacon Characteristics

Characteristic	Specification
Operating temperature range	Tmin = -20°C Tmax = +55°C
Operating lifetime	48 hours
Battery chemistry	Lithium-thionyl chloride
Battery cell size and number of cells	C-size LSH14 light, 4
Battery manufacturer	SAFT
Battery pack manufacturer and part number	Jotron AS, X-83056
Oscillator type (e.g. OCXO, MCXO, TCXO)	TCXO
Oscillator manufacturer	C-MAC
Oscillator part name and number	C-MAC E4520LF
Oscillator satisfies long-term frequency stability requirements (Yes or No)	Yes



Characteristic	Specification
Antenna type (Integrated or External)	Integrated
Antenna manufacturer	Jotron AS
Antenna part name and number	X-83053
Navigation device type (Internal, External or None)	None
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)	N/A
Features in beacon that ensures erroneous position data is not encoded into the beacon message (Yes, No or N/A)	N/A
Navigation device capable of supporting global coverage (Yes, No or N/A)	N/A
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	Fastrax
- Navigation device model name and part Number	Fastrax iTrax03-S
- GNSS system supported (e.g. GPS, GLONASS, Galileo)	GPS
For External Navigation Devices	
- Data protocol for GNSS receiver to beacon interface	N/A
- Physical interface for beacon to navigation device	N/A
- Electrical interface for beacon to navigation device	N/A
- Navigation device model and manufacturer (if beacon designed to use specific devices)	N/A



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.)	Strobe Light
- 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, 121.5 MHz
- Self-test can be activated directly at beacon (Yes or No)	Yes
- List of Items checked by self-test	Included in Manuals
- Self-test transmission burst duration (440 or 520 ms)	Both supported
- Self-test format bit ("0" or "1")	Both supported
Beacon includes a homer transmitter (if yes identify frequency of transmission)	121.5MHz
-Homer Transmit Power	20dBm
-Homer Duty Cycle	96%
-Duty Cycle of Homer Swept Tone	37%



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Characteristic	Specification
Beacon includes a strobe light (Yes or No)	Yes
- Strobe light intensity	Average of 1.9cd
- Strobe light flash rate	21 per minute
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.	None
Beacon includes automatic activation mechanism (Yes or No)	Yes



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1.2.4 Applicant Details

Company Name	Jotron AS		
Address	Østbyveien 1 PO Box 54 3280 Tjodalyng Norway		
Category of Applicant	<input checked="" type="checkbox"/> Manufacturer	<input type="checkbox"/> Importer	
	<input type="checkbox"/> Distributor	<input type="checkbox"/> Agent	
Contact Name	Eirik Storjordet	Telephone	+47 33139714
Email	eirik.storjordet@jotron.com	Facsimile	+47 33126780

1.2.5 Manufacturer Details

Company Name	See Applicant Details		
Address	N/A		
Contact Name	N/A	Telephone	N/A
Email	N/A	Facsimile	N/A

1.2.6 Declaration of Build Status

Hardware Version	000
- PCB Revision	MB: 0622, but modified according to 0703 Antenna: 0643
- Battery Model	

1.2.7 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: Eirik Storjordet

Position Held: Certification Manager

Date: 27.04.2007



1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a Jotron AS Tron 40GPS MkII and Tron 40S MkII as shown in the photograph below. A full technical description can be found in the manufacturer's documentation.



Equipment Under Test, Sample Serial Number 001



1.3.2 Test Configuration

Tests requiring a conducted link to the EUT's transmitter were performed on test sample serial number 001 which was modified by the manufacturer to provide two 50Ω output ports, one for 121 MHz measurements, the other for 406 MHz measurements.

The EUT was capable of being mounted in a Float Free Cradle. EUT was tested out of said cradle except where otherwise specified.

The EUT was powered by its internal battery.

1.3.3 Modes of Operation

Modes of operation of the EUT during testing were as follows:

Test Mode 1: Idle; Beacon in quiescent state (main switch set to 'READY').

Test Mode 2: Operating; Beacon activated using the main switch. 406 MHz and 121MHz Transmitters active, EUT programmed with test mode as per Cospas-Sarsat T.007. Note: this is sometimes referred to as "Normal" mode due to the normal frame sync.

Test Mode 3: Self-test mode; Beacon activated using the main switch. Pre-programmed self-test mode runs and beacon subsequently returns to idle mode.

Specific test modes used are detailed in the test procedure for each individual test.

1.3.4 Monitoring of Performance

Aliveness Test comprises successful self-test of beacon into a beacon tester and confirmation strobe flashes on EUT.

1.3.5 Performance Criterion

EUT must successfully complete the aliveness test.

1.3.6 Additional Variants

Variants of the Tron 40GPS MkII include the Tron 40S MkII, a non-GPS version of the EPIRB. For the purposes of this report testing conducted and successfully passed can be considered to indicate a pass for both variants, see customer supplied information ("Similarity of Variants") in Annex A.

Cospas-Sarsat Approval has been sought for the variants subject to the successful completion of the Spurious Emissions, Beacon Coding Software, Satellite Qualitative, Self Test and Digital Message tests (T.007 Issue 4 - Rev 1 October 2006, in accordance with Section 6.4). Separate submissions were made to the Cospas-Sarsat Secretariat.



1.4 DEVIATIONS FROM THE STANDARD

The Salt Fog test (section 2.6) was conducted in accordance with another standard to more severe test conditions; see test details for further information.

1.5 MODIFICATION RECORD

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

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	Software update to version 1.01 to fix Repetition Rate problem	TÜV Product Service Ltd (SW Supplied by Jotron AS)	08 March 2007
2	Software update to version 1.02 to fix 121MHz Spurious Emissions problem	TÜV Product Service Ltd (SW Supplied by Jotron AS)	20 March 2007
3	Software update to version 1.03 to fix Encoded position drop problem	TÜV Product Service Ltd (SW Supplied by Jotron AS)	25 May 2007
4	Software update to version 1.04 to fix modulation problem on last bit	TÜV Product Service Ltd (SW Supplied by Jotron AS)	05 June 2007
5	Software update to version 1.05 to fix problems encountered during Cospas-Sarsat testing	TÜV Product Service Ltd (SW Supplied by Jotron AS)	20 June 2007
6	Software update to version 1.06 to fix coarse position and delta offset problem	TÜV Product Service Ltd (SW Supplied by Jotron AS)	09 August 2007
7	Hardware change to fix self-test fault measuring 121.5MHz power Note: This modification only applied to EUT serial number 001	Jotron AS	11 September 2007

1.6 ALTERNATIVE TEST SITE

With the exception of the following tests all testing was conducted at TÜV Product Service Ltd's Octagon House Test Facility at Fareham, Hampshire.

TÜV Product Service Ltd conducted the following tests at Bearley, Stratford-upon-Avon Test Laboratory:

2.24 Peak Equivalent Radiated Power

TÜV Product Service Ltd conducted the following tests at MPI Services (UK) Limited, trading as Manor Marine, Portland, Dorset:

2.8 Drop Test in Water



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SECTION 2

TEST DETAILS

Emergency Beacons Testing of the
Jotron AS
Tron 40GPS MkII and Tron 40S MkII



TEST RESULTS TABLE

Parameter To Be Measured	Range Of Specification	Units	Test Results			Comments
			T _{min} (-20°C)	T _{amb}	T _{max} (+55°C)	
1. Initial Aliveness Test (A1.0)						Section 2.1 Result: Pass
• Aliveness Test:	Successful self-test	✓		✓		
2. Dry Heat Cycle (A3.0)						Section 2.2 Result: Pass
• Aliveness Test (during 2 hour period)	Successful self-test	✓			✓	
• Aliveness Test (at end of 2 hour period)	Successful self-test	✓			✓	
3. Damp Heat Cycle (A4.0)						Section 2.3 Result: Pass
• Aliveness Test (during 2 hour period)	Successful self-test	✓			✓	
• Aliveness Test (at end of 2 hour period)	Successful self-test	✓			✓	
4. Vibration Test (A5.0)						Section 2.4 Result: Pass
• Exterior Mechanical Inspection	No damage	✓		✓		
• Aliveness Test	Successful self-test	✓		✓		
• Activation	No activation during test	✓		✓		
5. Bump Test (A6.0)						Section 2.5 Result: Pass
• Exterior Mechanical Inspection	No damage	✓		✓		
• Aliveness Test	Successful self-test	✓		✓		
• Activation	No activation during test	✓		✓		
6. Salt Fog Test (A7.0)						Section 2.6 Result: Pass
• Exterior Mechanical Inspection	No damage	✓		✓		
• Aliveness Test	Successful self-test	✓		✓		



Parameter To Be Measured	Range Of Specification	Units	Test Results			Comments	
			T _{min} (-20°C)	T _{amb}	T _{max} (+55°C)		
7-A. Drop Test (A8.1) On Hard Surface						Section 2.7 Result: Pass	
<ul style="list-style-type: none"> Exterior Mechanical Inspection Aliveness Test Activation 	No damage Successful self-test No activation during test	✓ ✓ ✓	✓ ✓ ✓			The EUT was soaked at the minimum stowage temperature (-30°C) prior to the drop.	
7-B. Drop Test (A8.2) In Water							Section 2.8 Result: Pass
<ul style="list-style-type: none"> Exterior Mechanical Inspection Aliveness Test 	No damage Successful self-test	✓ ✓		✓ ✓			
8. Leakage And Immersion Test (A9.0)						Section 2.9 Result: Pass	
<ul style="list-style-type: none"> Aliveness Test Interior Inspection 	Successful self-test No water	✓ ✓		✓ ✓			
9. Spurious Emissions Test (A10.0)						Section 2.10 Result: Pass	
<ul style="list-style-type: none"> 406 MHz 121.5 MHz 	Figure 2-1 Figure 2-6	✓ ✓	✓ ✓	✓ ✓	✓ ✓		



Parameter To Be Measured	Range Of Specification	Units	Test Results		Comments
			High-Temperature		Low-Temperature
10. Thermal Shock (A11.0)					Sections 2.12 & 2.11 respectively Result: Pass*
<ul style="list-style-type: none"> • Self-activation in fresh water • Self-activation in salt water (5% NaCl by mass) • Aliveness Test: <ul style="list-style-type: none"> - Carrier Frequency • Frequency Stability: <ul style="list-style-type: none"> - short term stability - medium term stability: <ul style="list-style-type: none"> - mean slope - residual frequency variation 	5 5 406.028±0.001 0.002 0.001 0.003	minutes minutes MHz parts/ million in 100ms parts/ million/ minute parts/ million	0 0 406.0367474 406.0367476 6.754X10 ⁻¹⁰ 6.970X10 ⁻¹⁰ -3.687X10 ⁻¹⁰ -3.923X10 ⁻¹⁰ 5.346X10 ⁻¹⁰ 5.624X10 ⁻¹⁰	0* 0 406.0367688 406.0367688 6.254X10 ⁻¹⁰ 6.278X10 ⁻¹⁰ -2.260X10 ⁻¹¹ 4.901X10 ⁻¹³ 5.203X10 ⁻¹⁰ 5.475X10 ⁻¹⁰	*Upon removal of ice deposits Where two values are stated these are the minimum and maximum Note: Apparent failures are due to a band change in the Cospas-Sarsat system, limits are now 406.037±0.001
11. Cospas-Sarsat Type Approval (A12.0)					
Cospas-Sarsat Certificate	Provided (attach test report)	Y/N	N		Approval Pending at time of issue of this report



Parameter To Be Measured	Range Of Specification	Units	Test Results			Comments	
			T _{min} (-20°C)	T _{amb}	T _{max} (+55°C)		
12. Operational Life, Strobe Light and Self-tests (A13.0)						Section 2.13 Result: Pass MU	
<ul style="list-style-type: none"> • Operational Life 	Effective* Time to first Failure *see 'Comments'	Hours	67.62			Note: Time to first failure was 80.21 hours. However, this was reduced to an "Effective Time to First Failure" for reasons described in the appropriate section. Where two values are stated these are the minimum and maximum up to 80.21 hours Note: Apparent failures are due to a band change in the Cospas-Sarsat system, limits are now 406.037±0.001 * Measurement uncertainty is 1.2dB	
<ul style="list-style-type: none"> • Frequency: <ul style="list-style-type: none"> – Nominal Carrier – Short-term stability 	406.028±0.001 0.002	MHz parts/ million in 100ms	406.036943 406.036946 8.893x10 ⁻¹¹ 3.104x10 ⁻¹⁰				
<ul style="list-style-type: none"> • Medium-term stability: <ul style="list-style-type: none"> – Mean Slope – Residual Variation 	0.001 0.003	parts/ million/ minute parts/ million	-5.909x10 ⁻¹¹ 5.917x10 ⁻¹¹ 7.664x10 ⁻¹¹ 3.158x10 ⁻¹⁰				
<ul style="list-style-type: none"> • RF output power 	35 - 39	dBm	35.34 36.68				
<ul style="list-style-type: none"> • Auxiliary radio-locating Peak envelope power 	14 - 20	dBm	18.93 20.45*				
13. Strobe Light Test (A13.2)							Section 2.14 Result: Completed
<ul style="list-style-type: none"> • Test 	Completed	✓	✓*	✓*	✓*		* As per customer supplied information
14. Self-test (A13.3)							Section 2.15 Result: Pass
<ul style="list-style-type: none"> • RF pulse duration • Frame synchronisation pattern • Number of RF bursts 	<444 or <525* 0 1101 0000 1-burst	ms ✓ ✓	520.2609 ✓ ✓	520.2706 ✓ ✓	520.2208 ✓ ✓	* Range Of Specification dependant on message length. EUT coded with long message, hence limit is <525ms	



Parameter To Be Measured	Range Of Specification	Units	Test Results			Comments
			T _{min} (-20°C)	T _{amb}	T _{max} (+55°C)	
15. Automatic Release Mechanism Test						Section 2.16 Result: Completed
<ul style="list-style-type: none"> Normal mounted orientation Rolling 90° starboard Rolling 90° port Rolling 90° bow down Rolling 90° stern down Upside down 	Release and float free before 4 meters; automatic activation	✓ ✓ ✓ ✓ ✓ ✓	✓* [Redacted]	✓* ✓* ✓* ✓* ✓*	✓* [Redacted]	*Completed as per customer supplied information
16. Stability and Buoyancy Test (A15.0)						Section 2.17 Result: Pass
<ul style="list-style-type: none"> Time to upright Reserve buoyancy Float upright; Antenna base 	< 2 > 5 ≥ 4	seconds % cm	[Redacted]	< 1 49.4 4*	[Redacted]	*Customer supplied information
17. Inadvertent Activation Test (A16.0)						Section 2.18 Result: Completed
<ul style="list-style-type: none"> Test 	Completed	✓	[Redacted]	✓*	[Redacted]	* As per customer supplied information



Parameter To Be Measured	Range Of Specification	Units	Test Results			Comments
			T _{min} (-20°C)	T _{amb}	T _{max} (+55°C)	
18. Auxiliary Radio-Locating Device Transmitter Test (A17.0)						Result: Pass
• Carrier frequency	121.5 ± 0.006	MHz	121.4997666		121.4997202	Section 2.19
• Duty cycle	100	%	97.9		97.8	Section 2.20 Note: Duty cycle shown includes the allowed 2s cessation for 406MHz burst, result excluding this is 100% in both instances.
• Modulation:						
– Frequency	700 Hz within the range of 300 - 1600 Hz	✓	✓		✓	Section 2.21
– Range	> 700	Hz	944.30		945.75	
– Minimum	> 300	Hz	387.30		385.36	
– Maximum	< 1600	Hz	1331.6		1331.1	
– Direction	Upward	Upward / Downward	Downward*		Downward*	* EUT capable of both directions. When EUT is coded with "US settings" the direction is Upward.
– Duty cycle	33 - 55	%	33.61		35.73	
– Sweep repetition rate	2 - 4	Hz	2.61		2.70	
– Factor	0.85 - 1.0	#	0.873		0.937	Section 2.22
– Frequency Coherence	30% Power < ±30 Hz	✓	✓		✓	Section 2.23
– Frequency shift after 406 MHz burst	Shift < ±30 Hz	✓	✓		✓	
• PERP	14 - 20	dBm		18.99		Section 2.24
• Antenna:						
– Pattern	Omnidirectional	✓		✓		
– Polarisation	Vertical	✓		✓		
– VSWR	< 1.5:1	✓		N/A		Section 2.25



Parameter To Be Measured	Range Of Specification	Units	Test Results			Comments
			T _{min} (-20°C)	T _{amb}	T _{max} (+55°C)	
19. Humidity Test (A18.0)						Section 2.26 Result: Pass
• Aliveness Test	Successful self-test	✓			✓	
20. Orientation Test (A19.0)						Section 2.27 Result: Pass
Vertical						
• Aliveness Test	Successful self-test	✓			✓	
Upside Down						
• Aliveness Test	Successful self-test	✓			✓	
Horizontal						
• Aliveness Test	Successful self-test	✓			✓	



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2.1 INITIAL ALIVENESS TEST

2.1.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A1.0

2.1.2 Equipment Under Test

Tron 40S MkII, Serial Number 003

2.1.3 Date of Test and Modification State

15 February 2007 - Modification State 0

2.1.4 Test Equipment Used

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

2.1.5 Operating Modes

The test was performed with the EUT in the following mode(s): Normal



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2.1.6 Test Results

Beacon Test Report (Normal Message)

Beacon Test Report

1925E847E0FFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 5/12/05 4:19:58 PM
Tester Model/Serial No./File Name: BT100S/2383/jotron-1
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 27°C

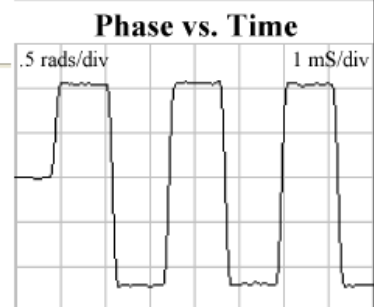
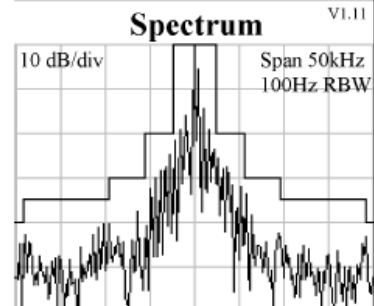
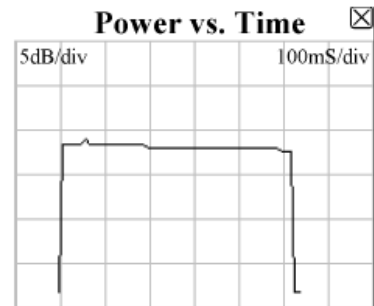
PASS
 FAIL
 INITIALS: _____

Notes: Add text comments here.

15 Hex ID: 1925E847E0FFBFF (1925E847E065C07)
Full Hex: FFFE2F8C92F423F032E03BBE5A378E46C33F
Burst Mode: Normal Mode (Long)
Protocol: EPIRB MMSI SLP Protocol
Country 201: Albania
MMSI: 999999
Beacon Number: 0
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: N 50°48'36"
Longitude: W 1°38'12"

406 MHz Measurements
406 Frequency (INT REF): 406.037 MHz
406 Power (INT ANT): 38%
Power Rise Time: < 5 ms
Phase Deviation: -1.2 +1.06 radians
Modulation Rise Time: 153 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0%
Modulation Bit Rate: 399.5 bps
CW Preamble: 160.7 ms

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.



Note: The date shown on the beacon tester is incorrect and should read 15-Feb-07.
 Furthermore, the "Tester Cal Due Date" is expired; this item of test equipment is "TU":
 Traceability Unscheduled.



Product Service

2.2 DRY HEAT CYCLE

2.2.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A3.0

2.2.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.2.3 Date of Test and Modification State

12 to 13 March 2007 - Modification State 1

2.2.4 Test Equipment Used

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

2.2.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle and Operating as per "Specification Reference", above.



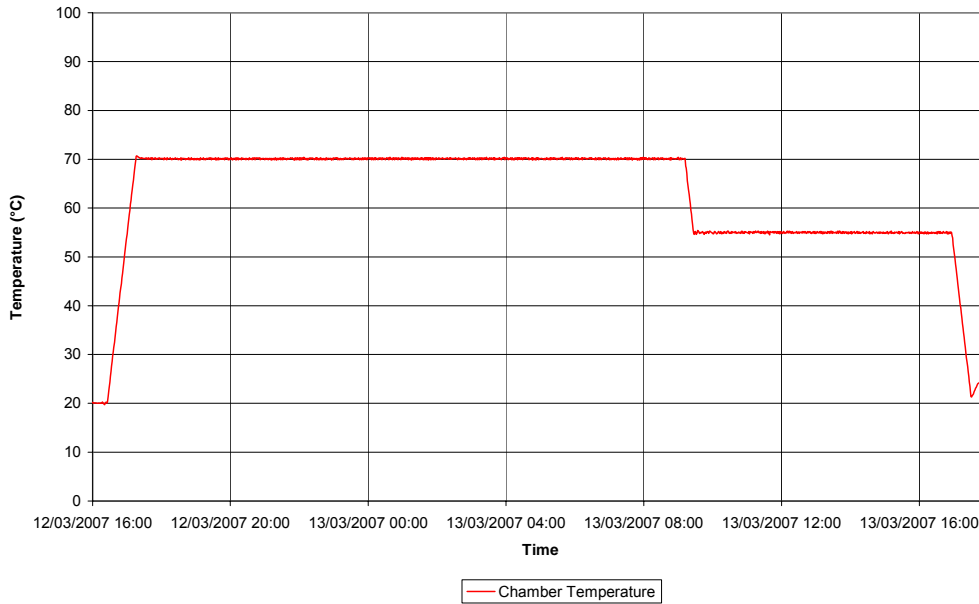
Test Set-up



Product Service

2.2.6 Environmental Conditions

Dry Heat Cycle Temperature Plot



2.2.7 Test Results

Summary of Aliveness test results

Stage	Pass / Fail
During Two Hour Dwell	Pass
End Of Two Hour Dwell	Pass



Product Service

Beacon Test Report (Aliveness Test, During Two Hour Dwell)

Beacon Test Report

A03D3CF400001

Organization: TUV Product Service Ltd
Tested By: Emergency Beacons Dept.
Date: 13-Feb-07 10:50:29 AM
Tester Model/Serial No./File Name: BT100S/1025/jotron-3
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 21°C

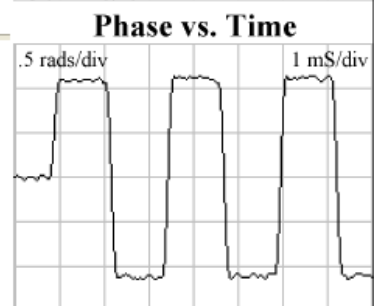
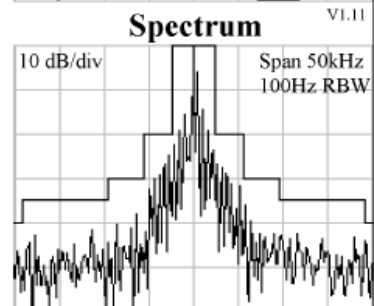
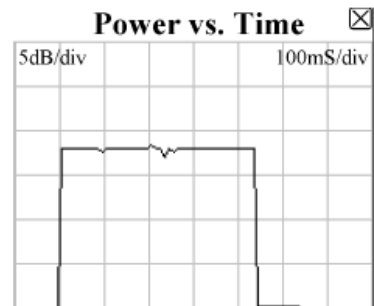
PASS **FAIL** **INITIALS:** _____

Notes: Add text comments here.

15 Hex ID: A03D3CF400001
Full Hex: FFFE2F501E9E7E7A00000D504837
Burst Mode: Normal Mode (Short)
Protocol: Test User Protocol
Country 257: Norway
National Use: 21783256236033

Emergency type: Non-Maritime
Activation type: Auto

406 MHz Measurements
406 Frequency (INT REF): 406.0372 MHz
406 Power (5 Watt): 34.9 dBm
Power Rise Time: : < 5 ms
Phase Deviation: -1.11 +1.12 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0.4%
Modulation Bit Rate: 399.5 bps
CW Preamble: 161 ms



DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.

Note: The date shown on the beacon tester is incorrect and should read 13-Mar-07. Furthermore the "Tester Cal Due Date" is expired; this item of test equipment is "TU": Traceability Unscheduled.



Product Service

Beacon Test Report (Aliveness Test, End Of Two Hour Dwell)

Beacon Test Report

A03D3CF400001

Organization: TUV Product Service Ltd
Tested By: Emergency Beacons Dept.
Date: 13-Feb-07 11:31:51 AM
Tester Model/Serial No./File Name: BT100S/1025/jotron-5
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 18°C

PASS **FAIL** **INITIALS:** _____

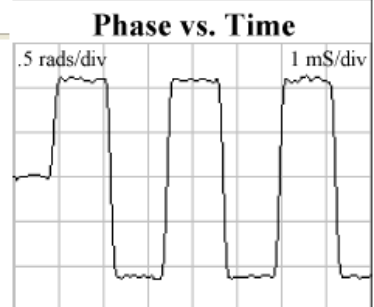
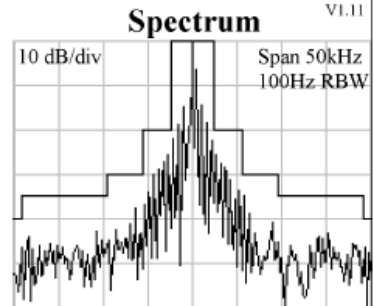
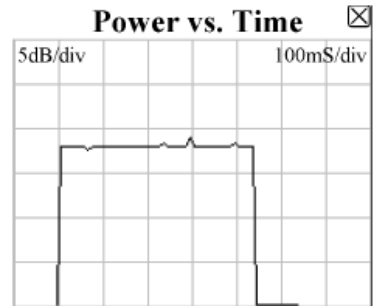
Notes: Add text comments here.

15 Hex ID: A03D3CF400001
Full Hex: FFFE2F501E9E7E7A00000D504837
Burst Mode: Normal Mode (Short)
Protocol: Test User Protocol
Country 257: Norway
National Use: 21783256236033

Emergency type: Non-Maritime
Activation type: Auto

406 MHz Measurements
406 Frequency (INT REF): 406.0372 MHz
406 Power (5 Watt): 35.1 dBm
Power Rise Time: : < 5 ms
Phase Deviation: -1.11 +1.09 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 130 uS
Modulation Symmetry: 0.3%
Modulation Bit Rate: 399.5 bps
CW Preamble: 160.9 ms

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.



Note: The date shown on the beacon tester is incorrect and should read 13-Mar-07. Furthermore the "Tester Cal Due Date" is expired; this item of test equipment is "TU": Traceability Unscheduled.



Product Service

2.3 DAMP HEAT CYCLE

2.3.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A4.0

2.3.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.3.3 Date of Test and Modification State

15 to 16 February 2007 - Modification State 0

2.3.4 Test Equipment Used

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

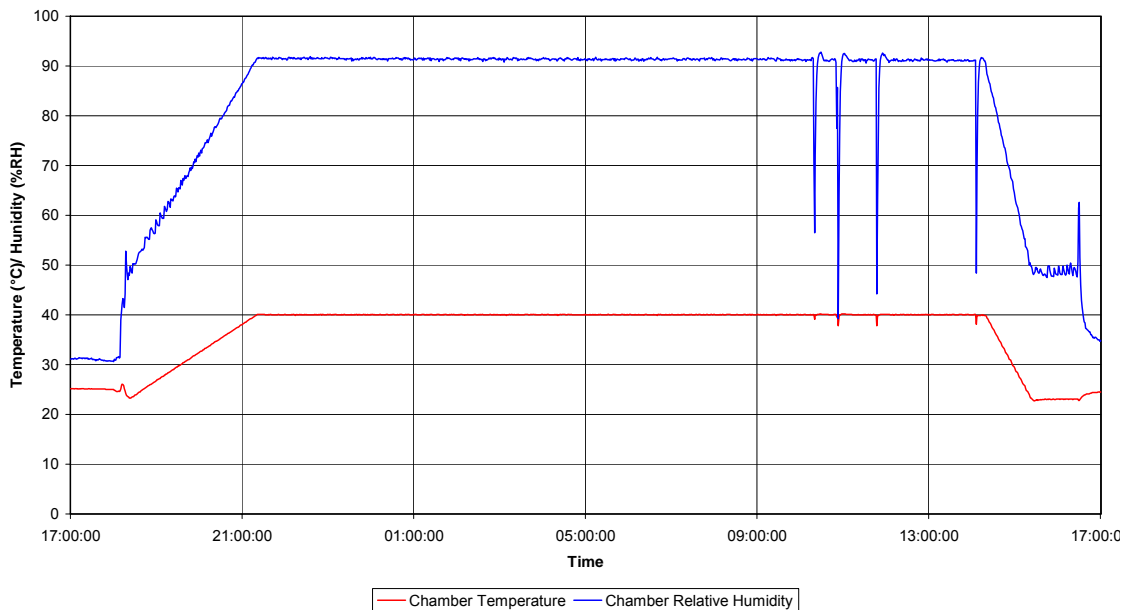
2.3.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle and Operating as per "Specification Reference", above.

2.3.6 Environmental Conditions

Damp Heat Cycle Temperature Plot

75900217 15-02-07 to 16-02-07





Product Service

2.3.7 Test ResultsSummary of Aliveness test results

Stage	Pass / Fail
During Two Hour Dwell, Message 1	Pass
During Two Hour Dwell, Message 2	Pass



Product Service

Beacon Test Report (Aliveness Test, During Two Hour Dwell, Message 1)

Beacon Test Report

A03D3CFCF400001

Organization: TUV Product Service Ltd
Tested By: Emergency Beacons Dept.
Date: 16-Feb-07 11:42:51 AM
Tester Model/Serial No./File Name: BT100S/1025/joepirb-1
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 23°C

PASS **FAIL** **INITIALS:** _____

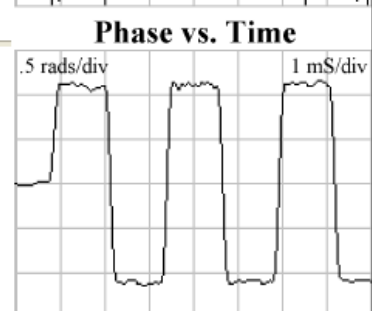
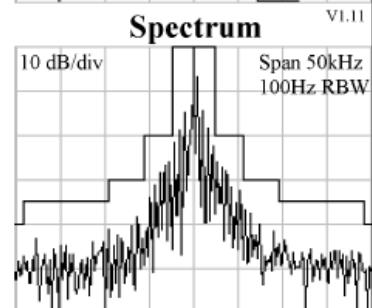
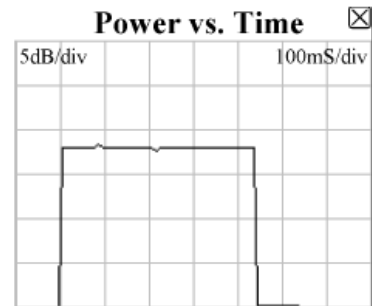
Notes: Add text comments here.

15 Hex ID: A03D3CFCF400001
Full Hex: FFFE2F501E9E7E7A00000D504837
Burst Mode: Normal Mode (Short)
Protocol: Test User Protocol
Country 257: Norway
National Use: 21783256236033

Emergency type: Non-Maritime
Activation type: Auto

406 MHz Measurements
406 Frequency (INT REF): 406.0372 MHz
406 Power (5 Watt): 36.2 dBm
Power Rise Time: : < 5 ms
Phase Deviation: -1.11 +1.11 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0.8%
Modulation Bit Rate: 399.5 bps
CW Preamble: 160.6 ms

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.



Note: The "Tester Cal Due Date" is expired; this item of test equipment is "TU": Traceability Unscheduled.



Product Service

Beacon Test Report (Aliveness Test, During Two Hour Dwell, Message 2)

Beacon Test Report

A03D3CFCF400001

Organization: TUV Product Service Ltd
Tested By: Emergency Beacons Dept.
Date: 16-Feb-07 11:43:39 AM
Tester Model/Serial No./File Name: BT100S/1025/joepirb-2
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 25°C

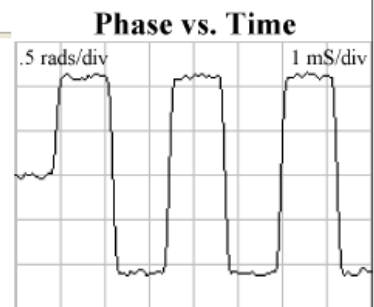
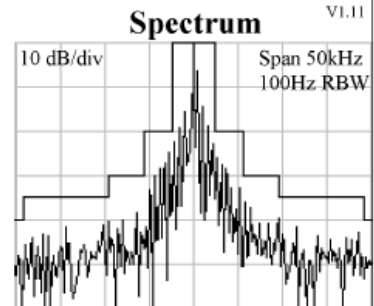
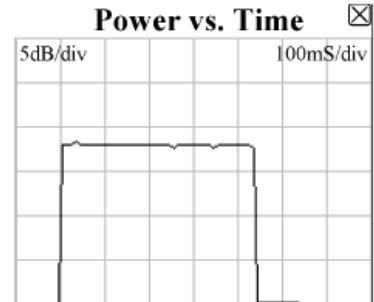
PASS
 FAIL
 INITIALS: _____

Notes: Add text comments here.

15 Hex ID: A03D3CFCF400001
Full Hex: FFFE2F501E9E7E7A00000D504837
Burst Mode: Normal Mode (Short)
Protocol: Test User Protocol
Country 257: Norway
National Use: 21783256236033

Emergency type: Non-Maritime
Activation type: Auto

406 MHz Measurements
406 Frequency (INT REF): 406.0372 MHz
406 Power (5 Watt): 36.2 dBm
Power Rise Time: : < 5 ms
Phase Deviation: -1.08 +1.11 radians
Modulation Rise Time: 142 uS
Modulation Fall Time: 165 uS
Modulation Symmetry: 0.8%
Modulation Bit Rate: 399.5 bps
CW Preamble: 160.5 ms



DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.

Note: The "Tester Cal Due Date" is expired; this item of test equipment is "TU": Traceability Unscheduled.



Product Service

2.4 VIBRATION TEST

2.4.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A5.0

2.4.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 002

2.4.3 Date of Test and Modification State

28 February and 01 March 2007 - Modification State 1

2.4.4 Test Equipment Used

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

2.4.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle



Test Set-up



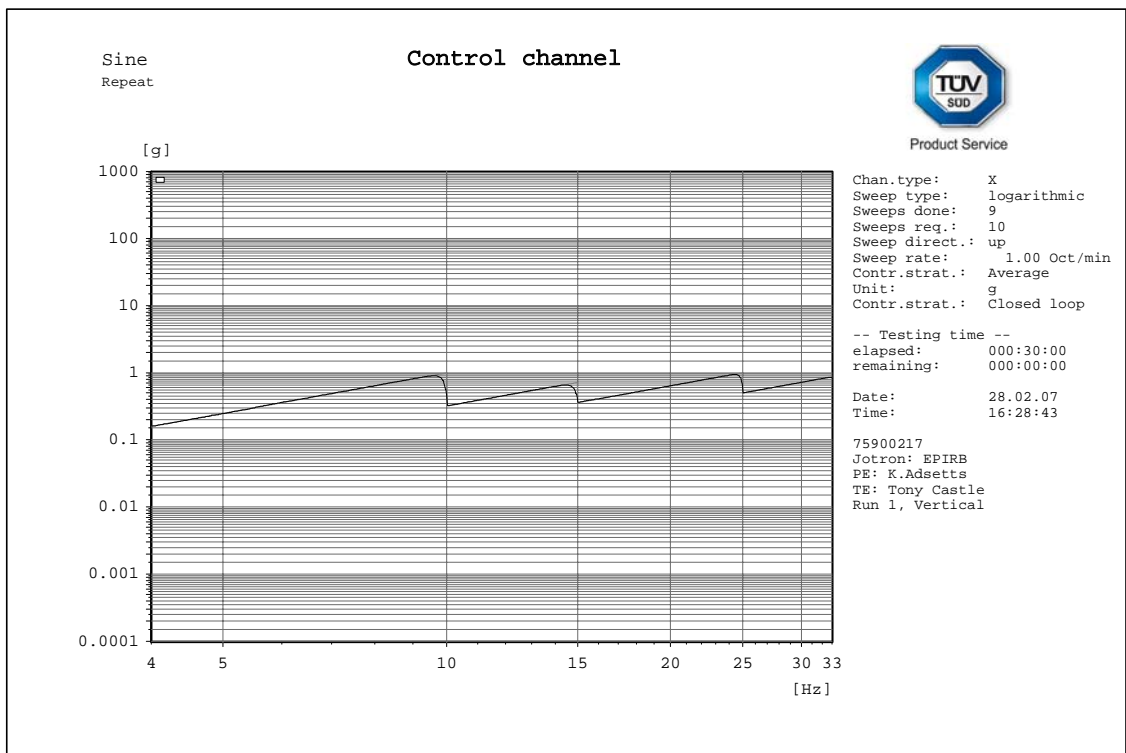
Product Service

2.4.6 Environmental Conditions

	28 February PM	01 March AM	01 March PM
Ambient Temperature	21.9°C	19.4°C	21.4°C
Relative Humidity	35%	39%	34%
Atmospheric Pressure	987mbar	988mbar	990mbar

2.4.7 Test Results

Vertical axis

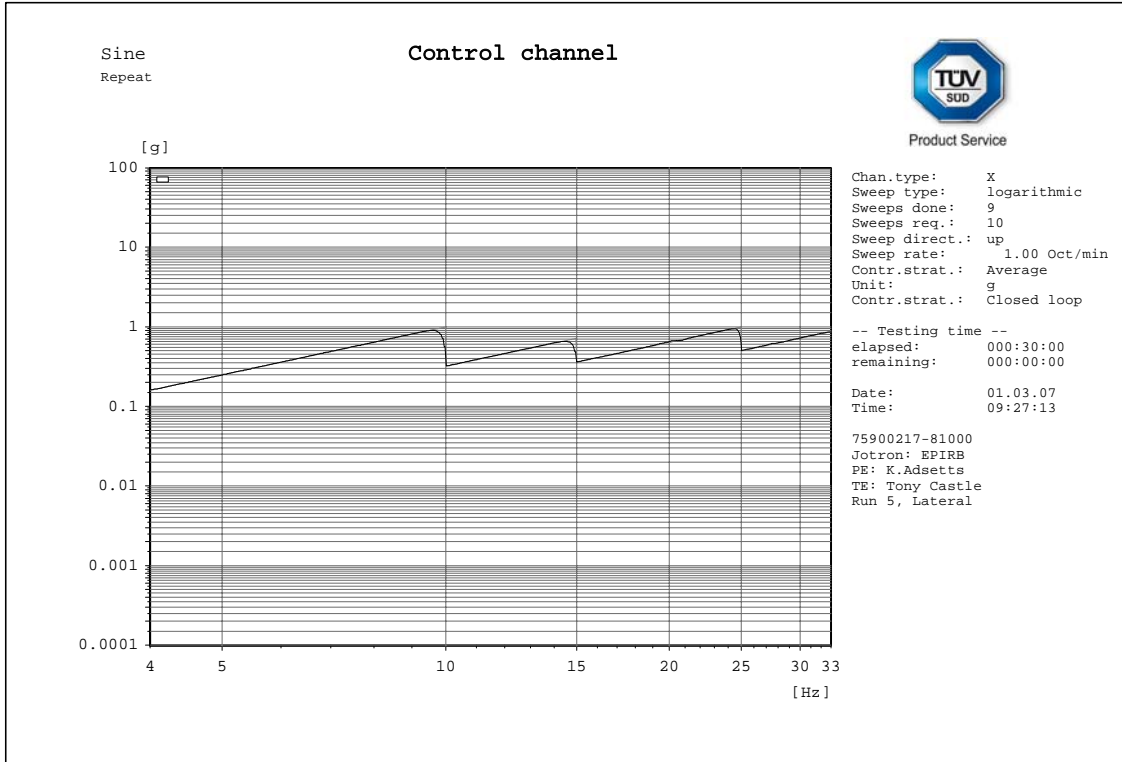


C:\VcpNT\Daten\m+p\Jotron\Swept Sine 30 Mins 010.rsn



Product Service

Lateral axis

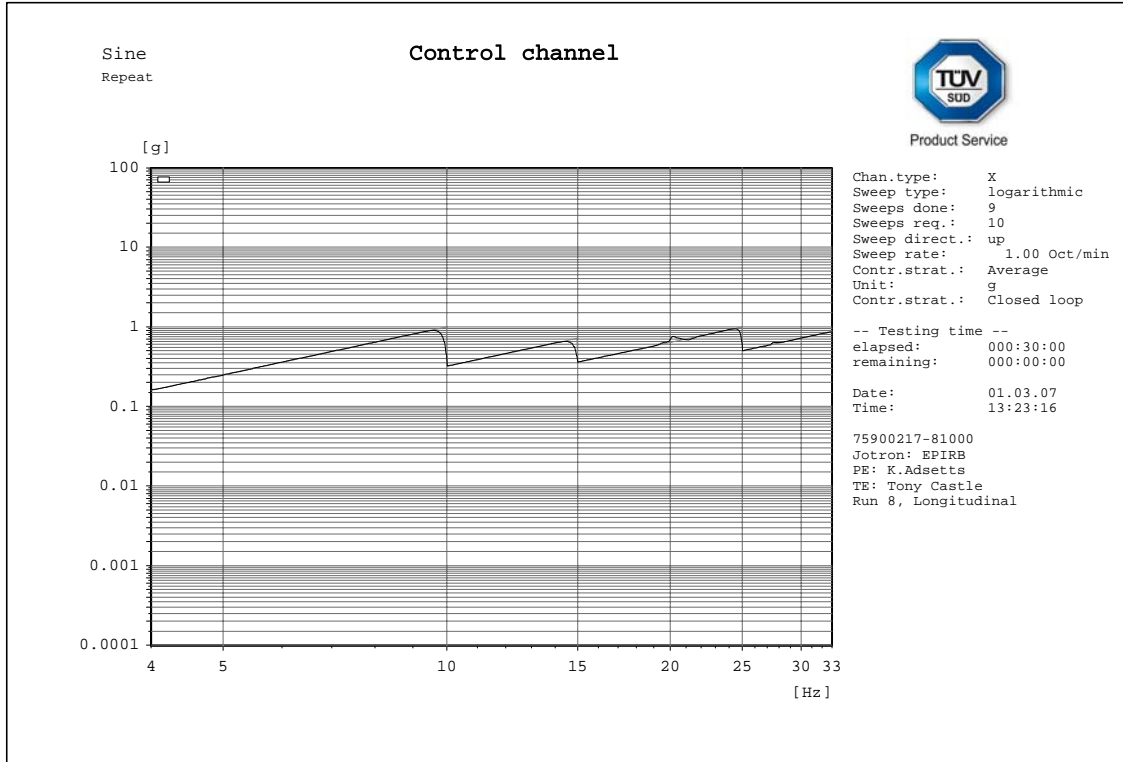


C:\VcpNT\Daten\m+p\Jotron\Swept Sine 30 Mins 1 002.rsn



Product Service

Longitudinal axis



C:\VcpNT\Daten\m+p\Jotron\Swept Sine 30 Mins 1 003.rsn

Mechanical Inspection

No signs of mechanical degradation could be witnessed.

Summary of Aliveness test results

Stage	Pass / Fail
Post-Vertical Axis	Pass
Post-Lateral Axis	Pass
Post- Longitudinal Axis	Pass



Product Service

Beacon Test Report (Aliveness Test, Post-run 1)

Beacon Test Report

203DE7E7A0FFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/21/05 2:51:48 AM
Tester Model/Serial No./File Name: BT100S/2383/jotron epirb vib-15
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 25°C

PASS
 FAIL
 INITIALS: _____

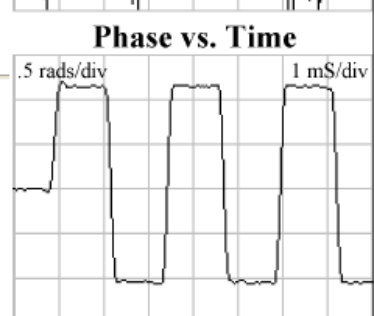
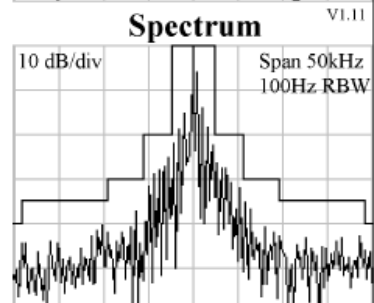
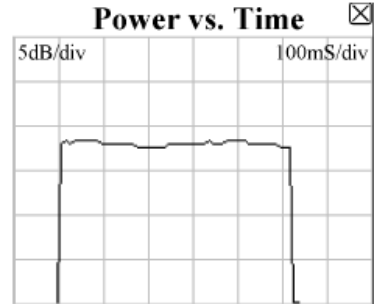
Notes: Add text comments here.

15 Hex ID: 203DE7E7A0FFBFF
Full Hex: FFFED0901EF3F3D07FDF81CA77783E0F66C
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 15987664

Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * * * * *
Longitude: * * * * *

406 MHz Measurements
406 Frequency (INT REF): 406.037 MHz
406 Power (INT ANT): 83%
Power Rise Time: < 5 ms
Phase Deviation: -1.03 +1.15 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0.4%
Modulation Bit Rate: 399.5 bps
CW Preamble: 161 ms

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.



Note: The date shown on the beacon tester is incorrect and should read 01-Mar-07. The time is also incorrect and actual time is after the time/date displayed on the appropriate plot above. Furthermore, the "Tester Cal Due Date" is expired; this item of test equipment is "TU": Traceability Unscheduled.



Product Service

Beacon Test Report (Aliveness Test, Post-Lateral Axis)

Beacon Test Report

203DE7E7A0FFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/21/05 4:11:39 AM
Tester Model/Serial No./File Name: BT100S/2383/jotron epirb vib-16
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 21°C

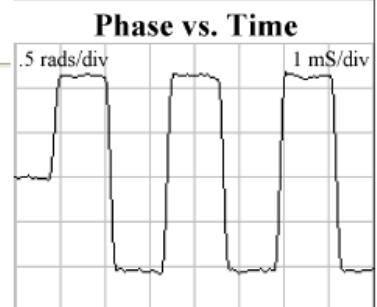
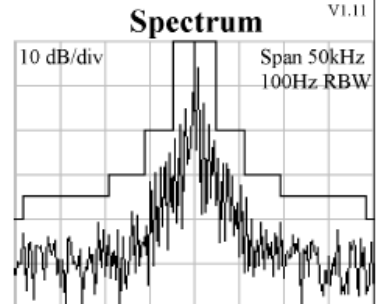
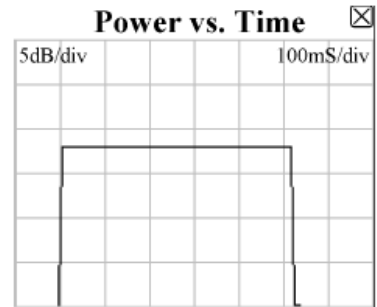
PASS **FAIL** **INITIALS:** _____

Notes: Add text comments here.

15 Hex ID: 203DE7E7A0FFBFF
Full Hex: FFFED0901EF3F3D07FDFF81CA77783E0F66C
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 15987664

Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * * * * *
Longitude: * * * * *

406 MHz Measurements
406 Frequency (INT REF): 406.037 MHz
406 Power (INT ANT): 89%
Power Rise Time: < 5 ms
Phase Deviation: -1.04 +1.14 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 130 uS
Modulation Symmetry: 0.4%
Modulation Bit Rate: 399.7 bps
CW Preamble: 161 ms



DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.

Note: The date shown on the beacon tester is incorrect and should read 01-Mar-07. The time is also incorrect and actual time is shortly after the time displayed on the appropriate plot above. Furthermore, the "Tester Cal Due Date" is expired; this item of test equipment is "TU": Traceability Unscheduled.



Product Service

Beacon Test Report (Aliveness Test, Post-test)

Beacon Test Report

203DE7E7A0FFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/21/05 8:21:11 AM
Tester Model/Serial No./File Name: BT100S/2383/jotron epirb sweep vib-19
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 23°C

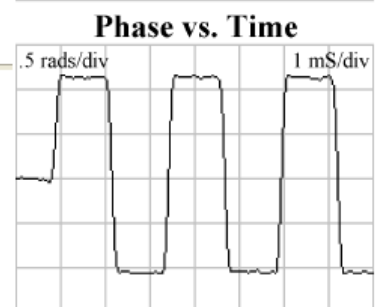
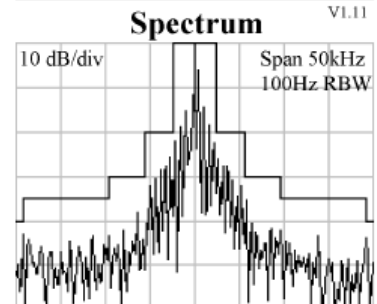
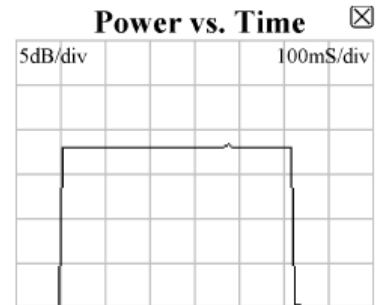
PASS **FAIL** **INITIALS:** _____

Notes: Add text comments here.

15 Hex ID: 203DE7E7A0FFBFF
Full Hex: FFFED0901EF3F3D07FDFF81CA77783E0F66C
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 15987664

Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * * * * *
Longitude: * * * * *

406 MHz Measurements
406 Frequency (INT REF): 406.037 MHz
406 Power (INT ANT): 88%
Power Rise Time: < 5 ms
Phase Deviation: -1.05 +1.13 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0.8%
Modulation Bit Rate: 399.5 bps
CW Preamble: 160.6 ms



DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.

Note: The date shown on the beacon tester is incorrect and should read 01-Mar-07. The time is also incorrect and actual time is shortly after the time displayed on the appropriate plot above. Furthermore, the "Tester Cal Due Date" is expired; this item of test equipment is "TU": Traceability Unscheduled.



Product Service

2.5 BUMP TEST

2.5.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A6.0

2.5.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 002

2.5.3 Date of Test and Modification State

01 March 2007 - Modification State 1

2.5.4 Test Equipment Used

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

2.5.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle

Physical test configuration: as per Vibration Test, above.

2.5.6 Environmental Conditions

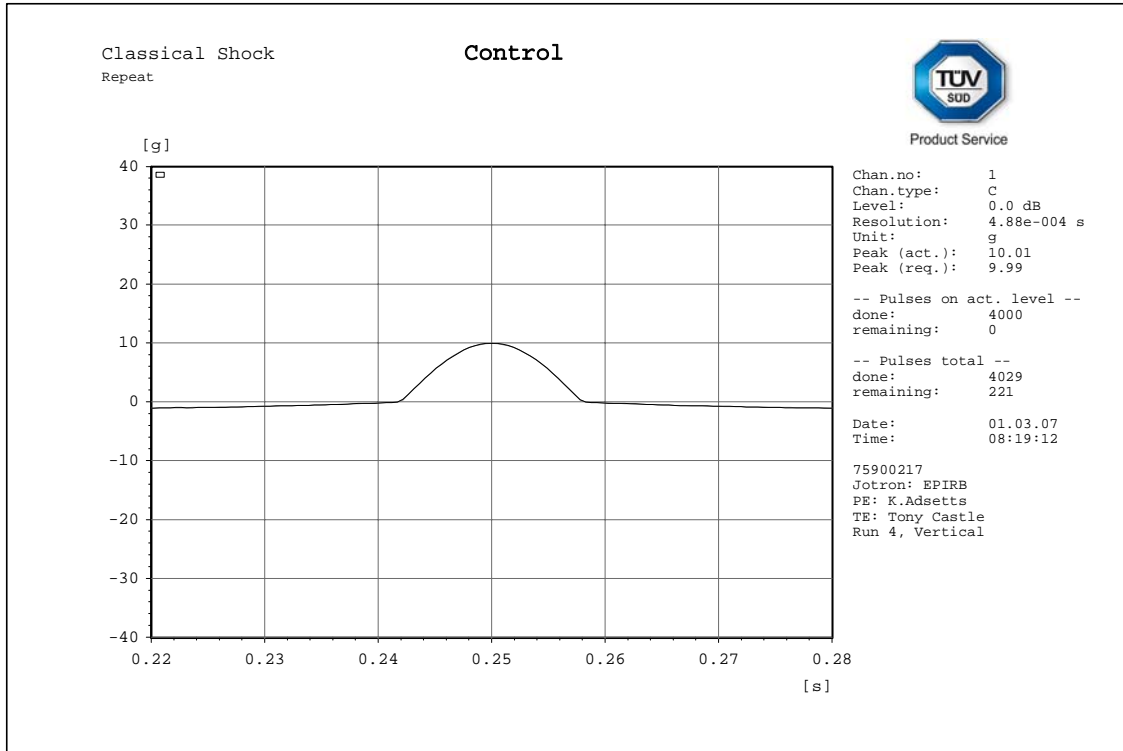
Ambient Temperature	19.4°C
Relative Humidity	39%
Atmospheric Pressure	988mbar



Product Service

2.5.7 Test Results

Vertical Axis, 4000 Bumps



C:\VcpNT\Daten\m+p\Jotron\Bump 10g 16ms 003.rcs

Mechanical Inspection

No signs of mechanical degradation could be witnessed.



Product Service

Beacon Test Report (Aliveness Test, Post-test)

Beacon Test Report

203DE7E7A0FFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 3/9/07 8:14:06 AM
Tester Model/Serial No./File Name: BT100S/2383/jotron epirb presalt-72
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 31°C

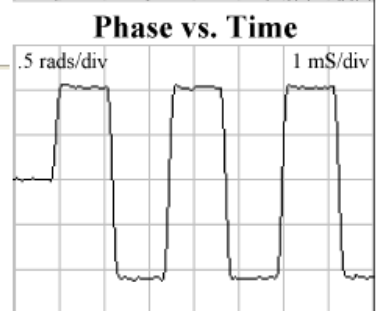
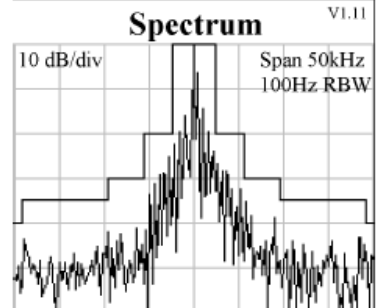
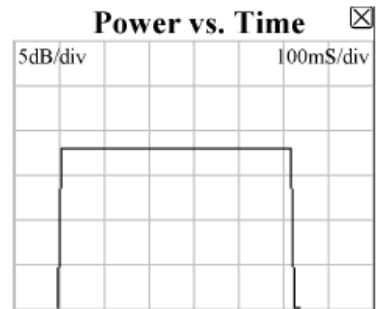
PASS
 FAIL
 INITIALS: _____

Notes: Add text comments here.

15 Hex ID: 203DE7E7A0FFBFF
Full Hex: FFFED0901EF3F3D07FDFF81CA77783E0F66C
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 15987664

Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * * * * *
Longitude: * * * * *

406 MHz Measurements
406 Frequency (INT REF): 406.0369 MHz
406 Power (INT ANT): 87%
Power Rise Time: < 5 ms
Phase Deviation: -1.09 +1.02 radians
Modulation Rise Time: 153 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0.4%
Modulation Bit Rate: 399.5 bps
CW Preamble: 160.9 ms



DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.

Note: The "Tester Cal Due Date" is expired; this item of test equipment is "TU": Traceability Unscheduled.



Product Service

2.6 SALT FOG TEST

2.6.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A7.0

Note: Test performed in accordance with IEC 60945: 2002, Clause 8.7, analysis conducted indicates that the aforementioned clause outlines test conditions more severe than those of RTCM Paper 77-2002/SC110-STD, Clause A7.0. Test duration is much longer and storage times are at high humidity and temperature allowing ionic solution (salt spray) to remain more active (high temperature) on the surface of the EUT for longer without evaporating (high humidity). Hence, the EUT was “over tested”.

2.6.2 Equipment Under Test

Tron 40S MkII, Serial Number 003

2.6.3 Date of Test and Modification State

09 March to 06 April 2007 - Modification State 1

2.6.4 Test Equipment Used

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

2.6.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle



Test Set-up

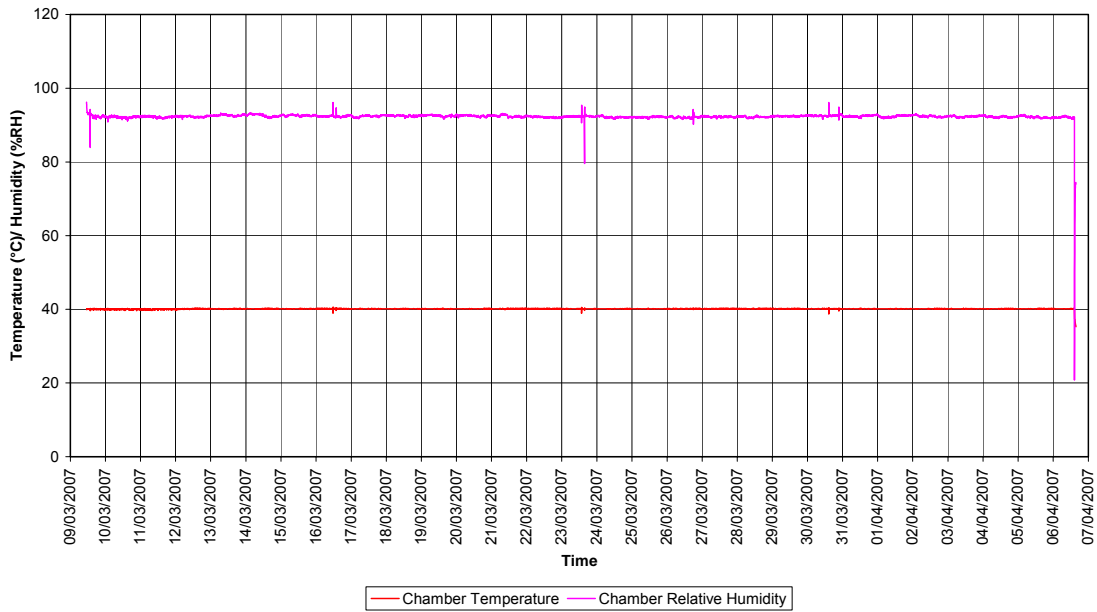


Product Service

2.6.6 Environmental Conditions

Salt Spray Temperature Plot

Salt Storage 09-03-07 to 06-04-07



Note: Plot shows several 'spikes' throughout the test – these were the result of removal of the test sample for the 2 hour salt sprays at 7 day intervals.

2.6.7 Test Results

Before the test the EUT was visually inspected for any signs of deterioration, none was found. The EUT was also subjected to an Aliveness Test, see Beacon Test Report below.

Posttest the EUT was inspected, no undue deterioration or corrosion of metal parts was noted. An Aliveness test was completed satisfactorily, see Beacon Test Report below



Product Service

Beacon Test Report (Aliveness Test, Pre-test)

Beacon Test Report

1925E847E0FFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 5/12/05 4:19:58 PM
Tester Model/Serial No./File Name: BT100S/2383/jotron-1
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 27°C

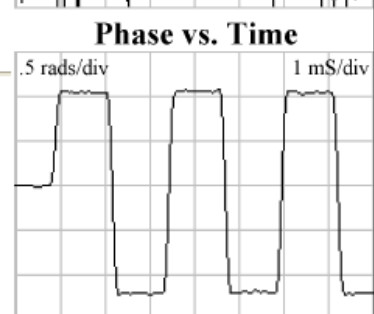
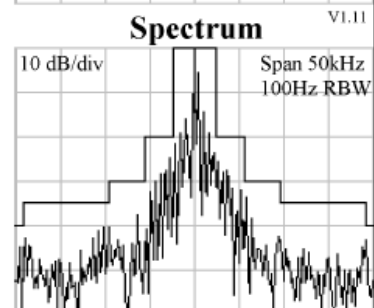
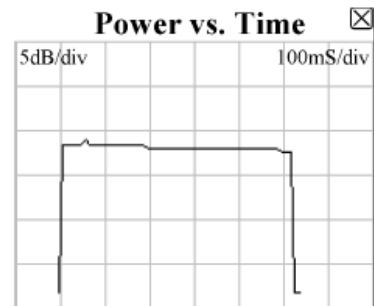
PASS **FAIL** **INITIALS:** _____

Notes: Add text comments here.

15 Hex ID: 1925E847E0FFBFF (1925E847E065C07)
Full Hex: FFFE2F8C92F423F032E03BBE5A378E46C33F
Burst Mode: Normal Mode (Long)
Protocol: EPIRB MMSI SLP Protocol
Country 201: Albania
MMSI: 999999
Beacon Number: 0
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: N 50°48'36"
Longitude: W 1°38'12"

406 MHz Measurements
406 Frequency (INT REF): 406.037 MHz
406 Power (INT ANT): 38%
Power Rise Time: < 5 ms
Phase Deviation: -1.2 +1.06 radians
Modulation Rise Time: 153 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0%
Modulation Bit Rate: 399.5 bps
CW Preamble: 160.7 ms

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.





Product Service

Beacon Test Report (Aliveness Test, Post-test)

Beacon Test Report

A03D3CF400001

Organization:

Tested By:

Date: 21-Dec-07 4:14:53 PM

Tester Model/Serial No./File Name: BT100S/1025/00217-60945Tshock-SN003-2

Tester Cal Due Date: Nov 10, 2006

Tester Temperature: 22°C



PASS



FAIL

INITIALS: _____

Notes: Add text comments here.

15 Hex ID: A03D3CF400001

Full Hex: FFFED0501E9E7E7A00000D504837

Burst Mode: Self Test Mode (Short)

Protocol: Test User Protocol

Country 257: Norway

National Use: 21783256236033

Emergency type: Non-Maritime

Activation type: Auto

406 MHz Measurements

406 Frequency (INT REF): 406.0372 MHz

406 Power (INT ANT): 84%

Power Rise Time: < 5 ms

Phase Deviation: -1.1 +1.14 radians

Modulation Rise Time: 153 uS

Modulation Fall Time: 165 uS

Modulation Symmetry: 0.4%

Modulation Bit Rate: 399.7 bps

CW Preamble: 159.8 ms

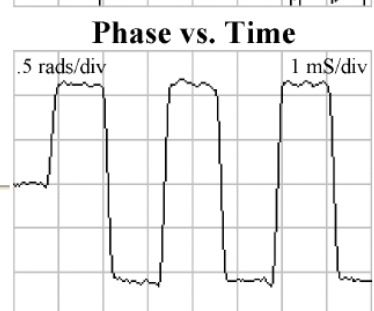
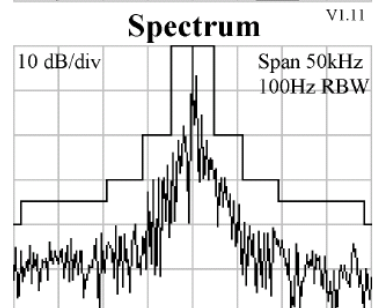
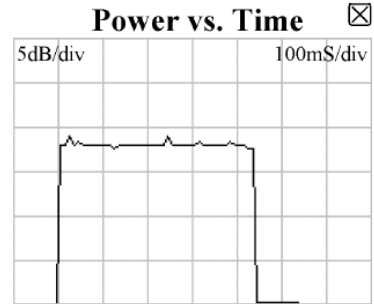
121.5 MHz Measurements

121 Frequency (INT REF): Detected.

121 Power (INT ANT): 37%

Signal was unmodulated.

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.



Note: The "Tester Cal Due Date" is expired; this item of test equipment is "TU": Traceability Unscheduled.



2.7 DROP TEST (ON HARD SURFACE)

2.7.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A8.1

2.7.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 002

2.7.3 Date of Test and Modification State

19 April 2007 - Modification State 2

2.7.4 Test Equipment Used

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

2.7.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle

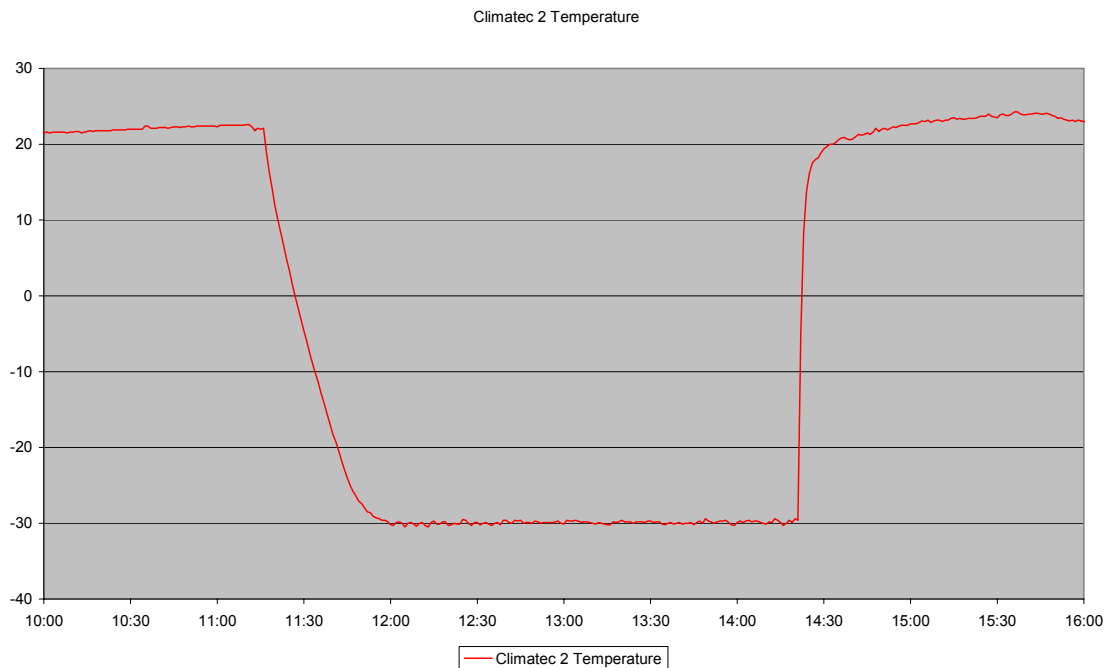


Test Set-up



2.7.6 Environmental Conditions

Preconditioning Temperature Plot



2.7.7 Test Results

The test piece was located into the test chamber which was set to -30°C for 2 hours 21 minutes.

The test piece was removed and the Drop-test was performed as follows:

- 1 drop from a height of 1 metre onto the test surface

On completion of the drop test the EUT was subjected to an Aliveness Test; it continued to operate correctly.



Product Service

2.8 DROP TEST (IN WATER)**2.8.1 Specification Reference**

RTCM Paper 77-2002/SC110-STD, Clause A8.2

2.8.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 002

2.8.3 Date of Test and Modification State

26 June 2007 - Modification State 5

2.8.4 Test Equipment Used

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

2.8.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle*

*Note: EUT activated (entered Operating mode automatically) on contact with water.

2.8.6 Test ResultsSummary of Aliveness test results

Stage	Pass / Fail
Pre-Upright Test	Pass
Post-Upright Test	Pass
Pre-Inverted Test	Pass
Post-Inverted Test	Pass
Pre-Horizontal Test	Pass
Post-Horizontal Test	Pass



Product Service

Beacon Test Report (Aliveness Test, Pre-Upright Test)

Beacon Test Report

203DE7E7A0FFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/26/07 3:03:13 PM
Tester Model/Serial No./File Name: BT100S/2383/EPIRBuprightPre-1
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 28°C

PASS **FAIL** **INITIALS:** _____

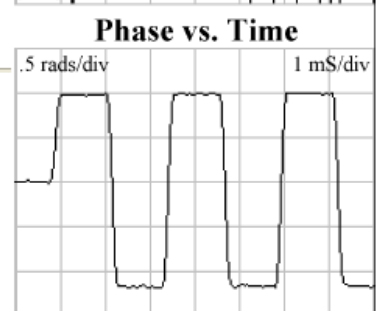
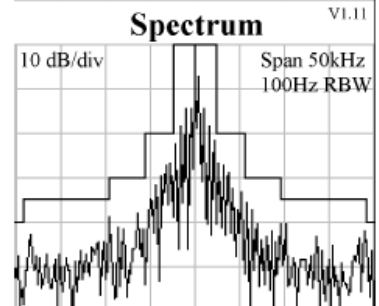
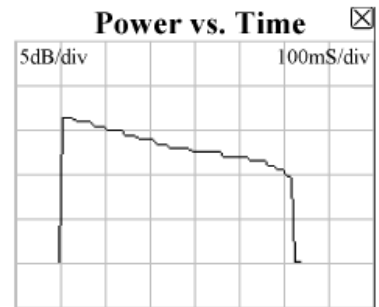
Notes: Add text comments here.

15 Hex ID: 203DE7E7A0FFBFF (203DE7E7A06540A)
Full Hex: FFFED0901EF3F3D032A05203BAB7
Burst Mode: Self Test Mode (Short)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 15987664

Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: N 50°30'00"
Longitude: W 2°30'00"

406 MHz Measurements
406 Frequency (INT REF): 406.0368 MHz
406 Power (INT ANT): 34%
Power Rise Time: < 5 ms
Phase Deviation: -1.16 +0.98 radians
Modulation Rise Time: 142 uS
Modulation Fall Time: 130 uS
Modulation Symmetry: 1.2%
Modulation Bit Rate: 399.7 bps
CW Preamble: 160.7 ms

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.





Product Service

Beacon Test Report (Aliveness Test, Post-Upright Test)

Beacon Test Report

203DE7E7A0FFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/26/07 3:06:36 PM
Tester Model/Serial No./File Name: BT100S/2383/EPIRBuprightPost-1
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 27°C

PASS **FAIL** **INITIALS:** _____

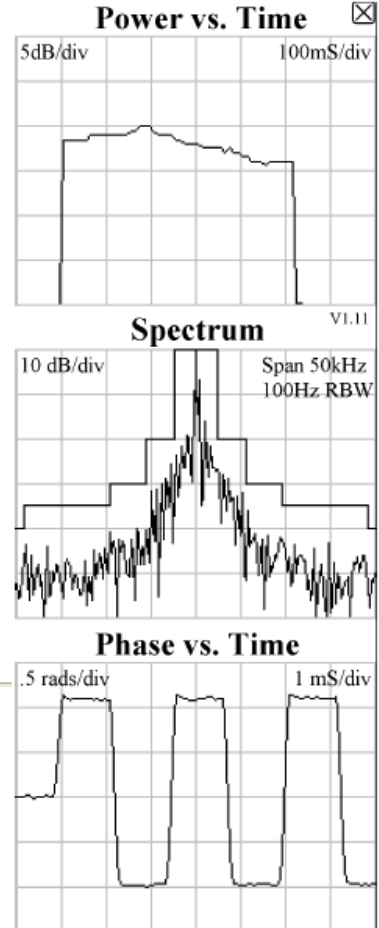
Notes: Add text comments here.

15 Hex ID: 203DE7E7A0FFBFF (203DE7E7A06540A)
Full Hex: FFFED0901EF3F3D032A05203BAB7
Burst Mode: Self Test Mode (Short)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 15987664

Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: N 50°30'00"
Longitude: W 2°30'00"

406 MHz Measurements
406 Frequency (INT REF): 406.0368 MHz
406 Power (INT ANT): 49%
Power Rise Time: < 5 ms
Phase Deviation: -0.98 +1.09 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0.4%
Modulation Bit Rate: 399.7 bps
CW Preamble: 160.6 ms

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Product Service

Beacon Test Report (Aliveness Test, Pre-Inverted Test)

Beacon Test Report

203DE7E7A0FFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/26/07 3:19:55 PM
Tester Model/Serial No./File Name: BT100S/2383/EPIRBinvertPre-1
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 28°C

PASS **FAIL** **INITIALS:** _____

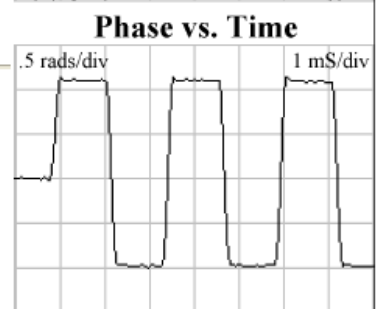
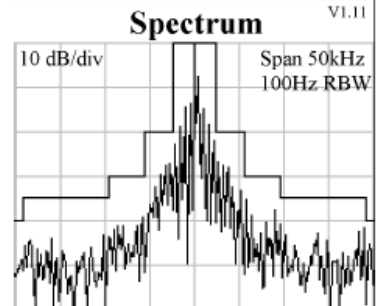
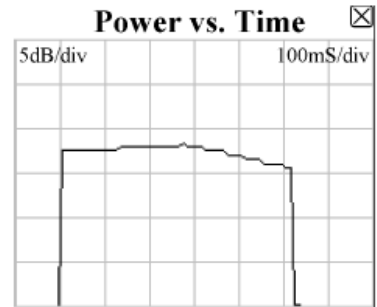
Notes: Add text comments here.

15 Hex ID: 203DE7E7A0FFBFF (203DE7E7A06540A)
Full Hex: FFFED0901EF3F3D032A05203BAB79083BE4F
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 15987664

Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: N 50°34'8"
Longitude: W 2°26'16"

406 MHz Measurements
406 Frequency (INT REF): 406.0368 MHz
406 Power (INT ANT): 45%
Power Rise Time: < 5 ms
Phase Deviation: -0.97 +1.1 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 130 uS
Modulation Symmetry: 0.8%
Modulation Bit Rate: 399.7 bps
CW Preamble: 160.6 ms

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.





Product Service

Beacon Test Report (Aliveness Test, Post-Inverted Test)

Beacon Test Report

203DE7E7A0FFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/26/07 3:24:56 PM
Tester Model/Serial No./File Name: BT100S/2383/EPIRBinvertPost-1
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 29°C

PASS **FAIL** **INITIALS:** _____

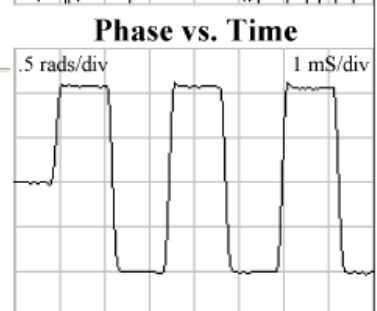
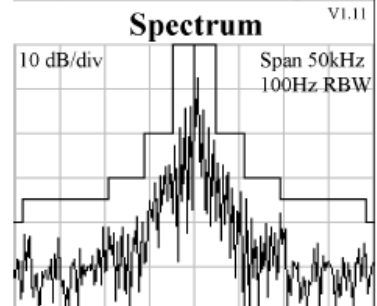
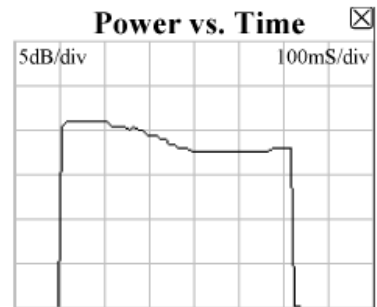
Notes: Add text comments here.

15 Hex ID: 203DE7E7A0FFBFF (203DE7E7A06540A)
Full Hex: FFFED0901EF3F3D032A05203BAB79083BE4F
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 15987664

Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: N 50°34'8"
Longitude: W 2°26'16"

406 MHz Measurements
406 Frequency (INT REF): 406.0368 MHz
406 Power (INT ANT): 62%
Power Rise Time: < 5 ms
Phase Deviation: -1 +1.07 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0.4%
Modulation Bit Rate: 399.7 bps
CW Preamble: 160.7 ms

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.





Product Service

Beacon Test Report (Aliveness Test, Pre-Horizontal Test)

Beacon Test Report

203DE7E7A0FFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/26/07 2:50:15 PM
Tester Model/Serial No./File Name: BT100S/2383/EPIRBuprightPre-4
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 27°C

PASS **FAIL** **INITIALS:** _____

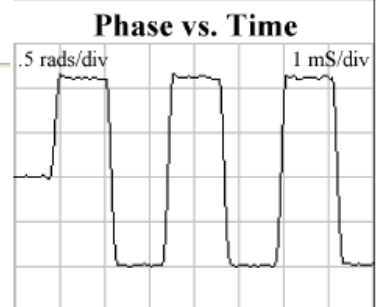
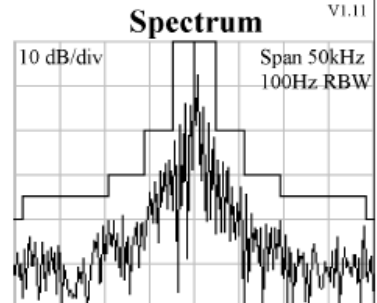
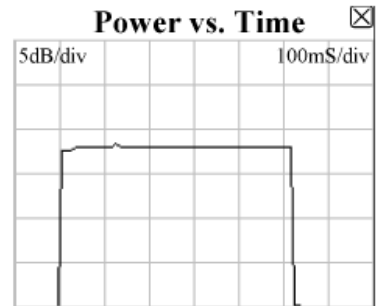
Notes: Add text comments here.

15 Hex ID: 203DE7E7A0FFBFF (203DE7E7A06540A)
Full Hex: FFFED0901EF3F3D032A05203BAB79083BE4F
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 15987664

Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: N 50°34'8"
Longitude: W 2°26'16"

406 MHz Measurements
406 Frequency (INT REF): 406.0368 MHz
406 Power (INT ANT): 52%
Power Rise Time: < 5 ms
Phase Deviation: -0.98 +1.12 radians
Modulation Rise Time: 142 uS
Modulation Fall Time: 153 uS
Modulation Symmetry: 0.8%
Modulation Bit Rate: 399.7 bps
CW Preamble: 160.8 ms

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.





Product Service

Beacon Test Report (Aliveness Test, Post-Horizontal Test)

Beacon Test Report
203DE7E7A0FFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/26/07 2:56:13 PM
Tester Model/Serial No./File Name: BT100S/2383/EPIRBuprightPost-1
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 26°C

PASS **FAIL** **INITIALS:** _____

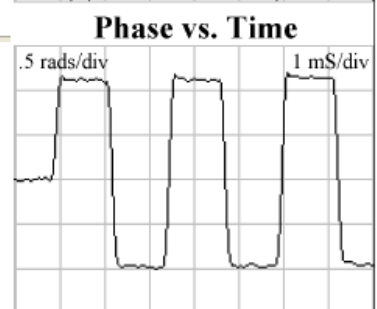
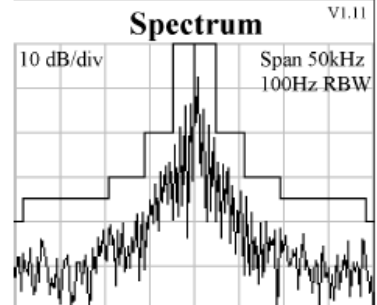
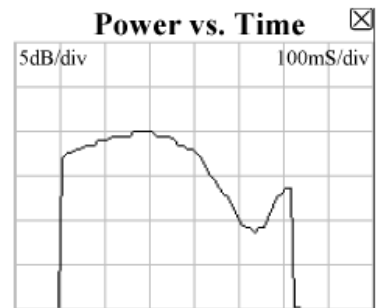
Notes: Add text comments here.

15 Hex ID: 203DE7E7A0FFBFF (203DE7E7A06540A)
Full Hex: FFFED0901EF3F3D032A05203BAB7
Burst Mode: Self Test Mode (Short)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 15987664

Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: N 50°30'00"
Longitude: W 2°30'00"

406 MHz Measurements
406 Frequency (INT REF): 406.0368 MHz
406 Power (INT ANT): 52%
Power Rise Time: > 5 ms
Phase Deviation: -0.96 +1.11 radians
Modulation Rise Time: 142 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 1.1%
Modulation Bit Rate: 399.7 bps

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.





Product Service

2.9 LEAKAGE AND IMMERSION TEST

2.9.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A9.0

2.9.2 Equipment Under Test

Tron 40S MkII, Serial Number 003

2.9.3 Date of Test and Modification State

25 to 28 January 2008 - Modification State 7

2.9.4 Test Equipment Used

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

2.9.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle*

*Note: EUT activated (entered Operating mode automatically) on contact with water.



Test Set-up

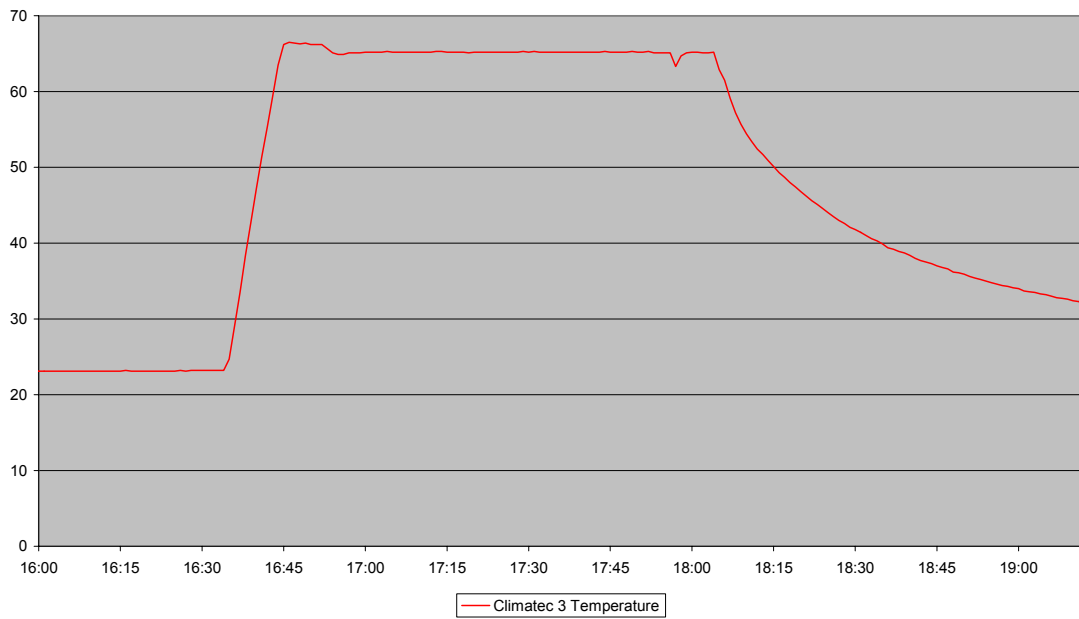


Product Service

2.9.6 Environmental Conditions

EUT Pre-conditioning

Climatec 3 Temperature 25/01/2008





Product Service

2.9.7 Test Results

25 January 2008

Prior to the commencement of the testing the EUT was subjected to an Aliveness Test and weighed:

- The test item operated correctly.
- Dry weight = 1.920 kg

The EUT was placed in the climatic chamber and preconditioned at a temperature of +65°C for 1 hour.

The EUT was located into the pressure vessel which had been filled with water (water temperature 19.8°C). The unit activated the moment it was immersed. The unit was prevented from floating to the surface with the use of a 5kg mass as seen in Test Setup, above.

28 January 2008

>48 hours after immersion the pressure was increased to +981 mbar (relative to atmospheric pressure) and maintained for a duration of 5 minutes 21 seconds.

The EUT was removed from the pressure vessel for post-test inspection. The test item was dried and its weight was recorded:

- Unit weight (post-test): 1.933 kg
- An Aliveness Test was conducted (see Beacon Test Report, below).

Detailed inspection of the EUT (involving partial dismantling) was conducted and, as no moisture was found inside, the additional 13g of water was attributed to water contained within the tether and outer portion of seals and switches.



Product Service

Beacon Test Report (Aliveness Test, Pre-test)

Beacon Test Report

A03D3CF400001

Organization:

Tested By:

Date: 25-Jan-08 4:20:27 PM

Tester Model/Serial No./File Name: BT100S/1025/00217_003-PreLeakage-1

Tester Cal Due Date: Nov 10, 2006

Tester Temperature: 20°C



PASS



FAIL

INITIALS: _____

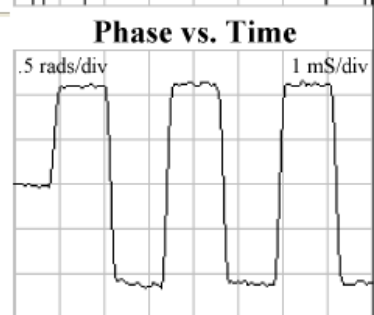
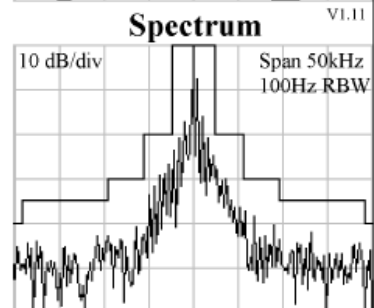
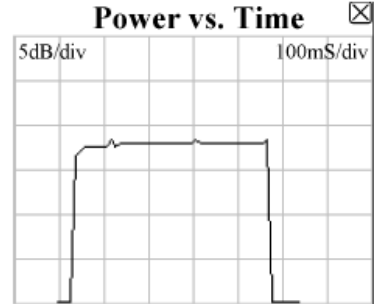
Notes: Add text comments here.

15 Hex ID: A03D3CF400001
Full Hex: FFFED0501E9E7E7A00000D504837
Burst Mode: Self Test Mode (Short)
Protocol: Test User Protocol
Country 257: Norway
National Use: 21783256236033

Emergency type: Non-Maritime
Activation type: Auto

406 MHz Measurements
406 Frequency (INT REF): 406.0372 MHz
406 Power (INT ANT): 89%
Power Rise Time: > 5 ms
Phase Deviation: -1.11 +1.12 radians
Modulation Rise Time: 153 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0.4%
Modulation Bit Rate: 399.5 bps

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.



Note: The "Tester Cal Due Date" is expired; this item of test equipment is "TU": Traceability Unscheduled.



Product Service

Beacon Test Report (Aliveness Test, Post-test)

Beacon Test Report

2025E7E7A0FFBFF

Organization:

Tested By:

Date: 28-Jan-08 10:42:56 AM

Tester Model/Serial No./File Name: BT100S/1025/00217_003-PostLeakage-1

Tester Cal Due Date: Nov 10, 2006

Tester Temperature: 20°C



PASS



FAIL

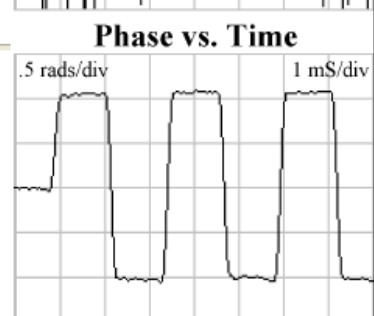
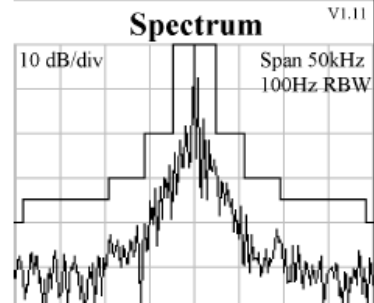
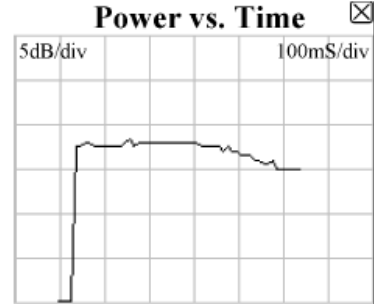
INITIALS: _____

Notes: Add text comments here.

15 Hex ID: 2025E7E7A0FFBFF
Full Hex: FFFED09012F3F3D07FDF964A0B7
Burst Mode: Self Test Mode (Short)
Protocol: EPIRB MMSI SLP Protocol
Country 257: Norway
MMSI: 999229
Beacon Number: 0
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * * * * *
Longitude: * * * * *

406 MHz Measurements
406 Frequency (INT REF): 406.0372 MHz
406 Power (INT ANT): 88%
Power Rise Time: > 5 ms
Phase Deviation: -1.02 +1.07 radians
Modulation Rise Time: 153 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0.4%
Modulation Bit Rate: 399.7 bps

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.



Note: The "Tester Cal Due Date" is expired; this item of test equipment is "TU": Traceability Unscheduled.



Product Service

2.10 SPURIOUS EMISSIONS TEST

2.10.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A10.0

2.10.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.10.3 Date of Test and Modification State

406 MHz Test at Ambient:	13 July 2007	- Modification State 5
121 MHz Test at Ambient:	30 August 2007	- Modification State 6
406 MHz Test at +55°C:	03 July 2007	- Modification State 5
121 MHz Test at +55°C:	14 September 2007	- Modification State 7
406 MHz Test at -20°C:	04 July 2007	- Modification State 5
121 MHz Test at -20°C:	12 September 2007	- Modification State 7

2.10.4 Test Equipment Used

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

2.10.5 Test Set-up and Operating Modes

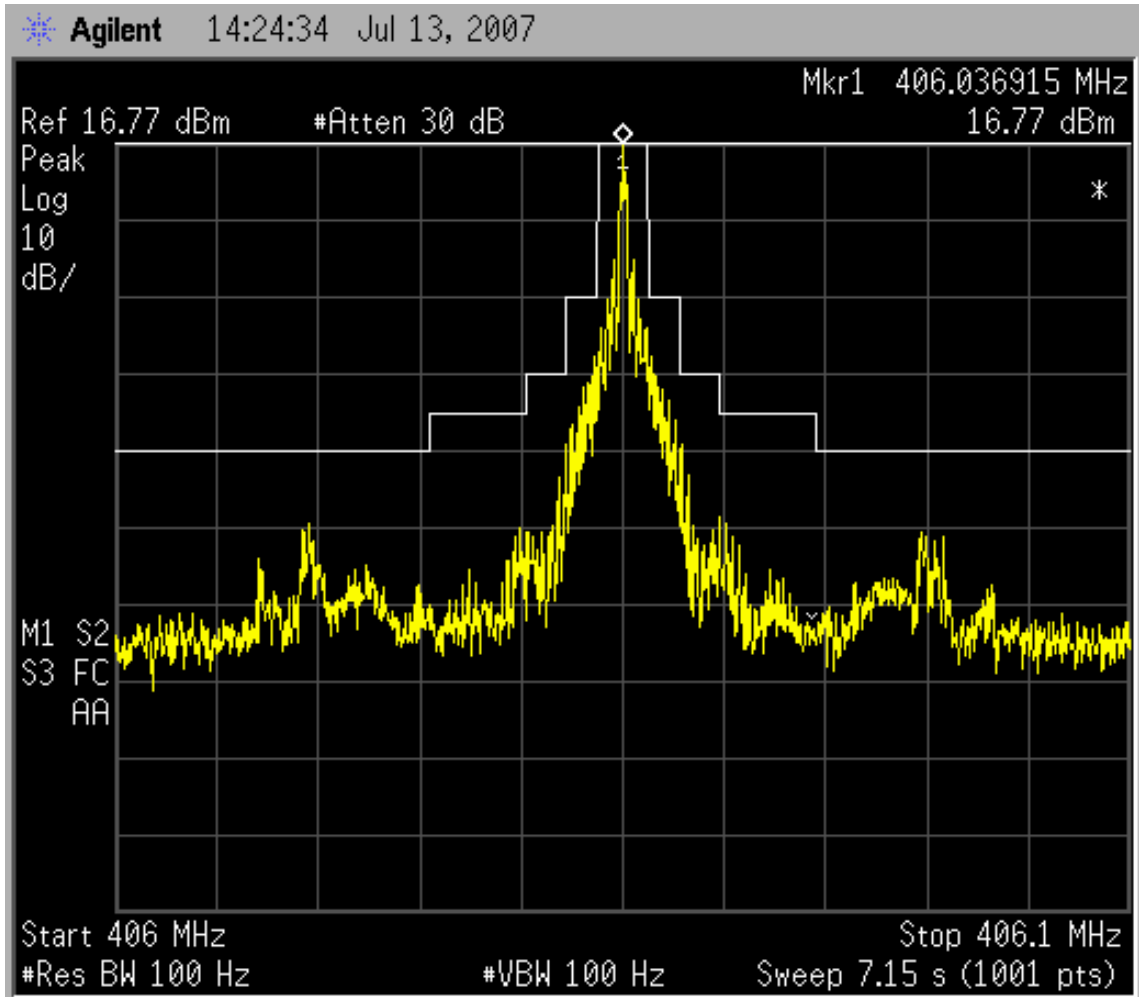
The test was performed with the EUT in the following mode(s): Operating



Product Service

2.10.6 Test Results

406 MHz Test at Ambient





Product Service

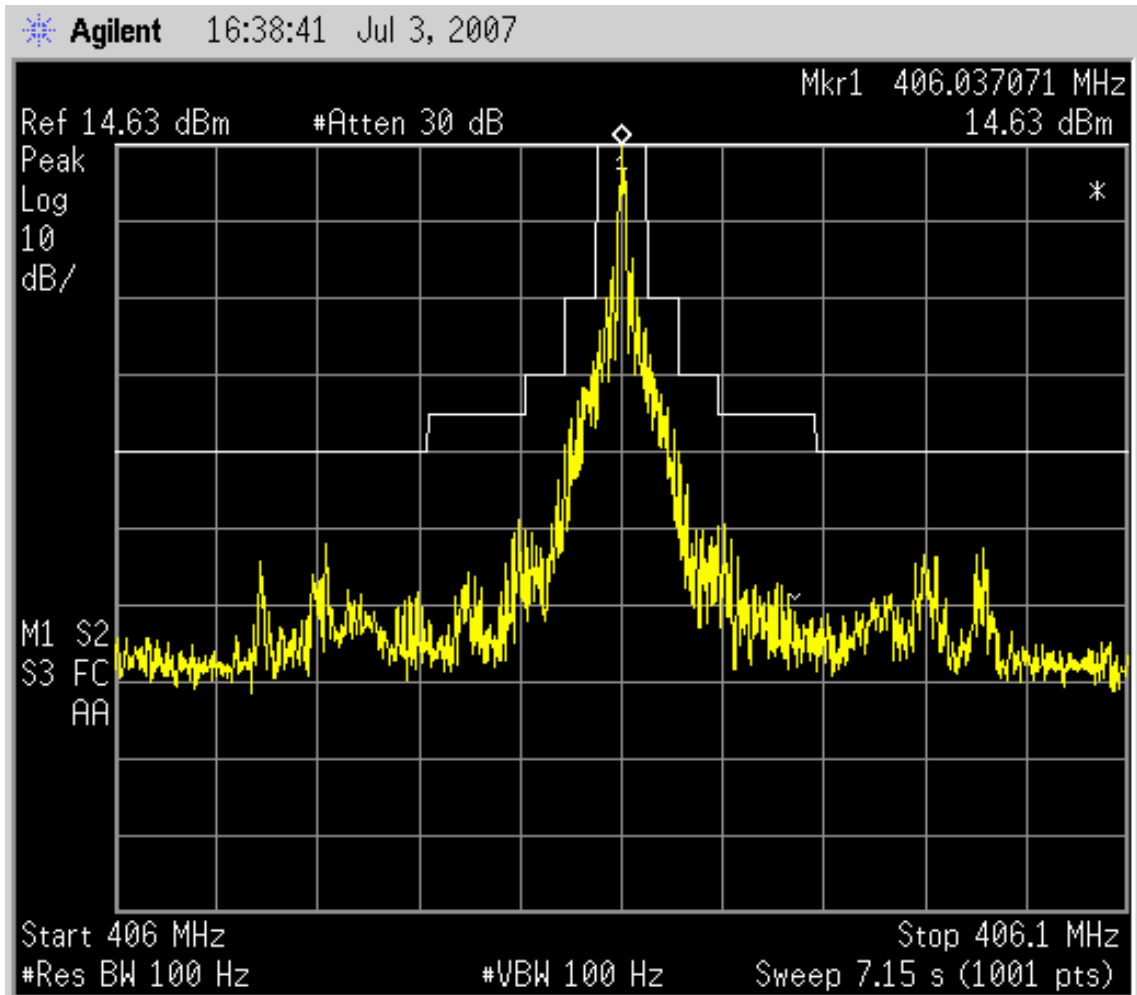
121 MHz Test at Ambient





Product Service

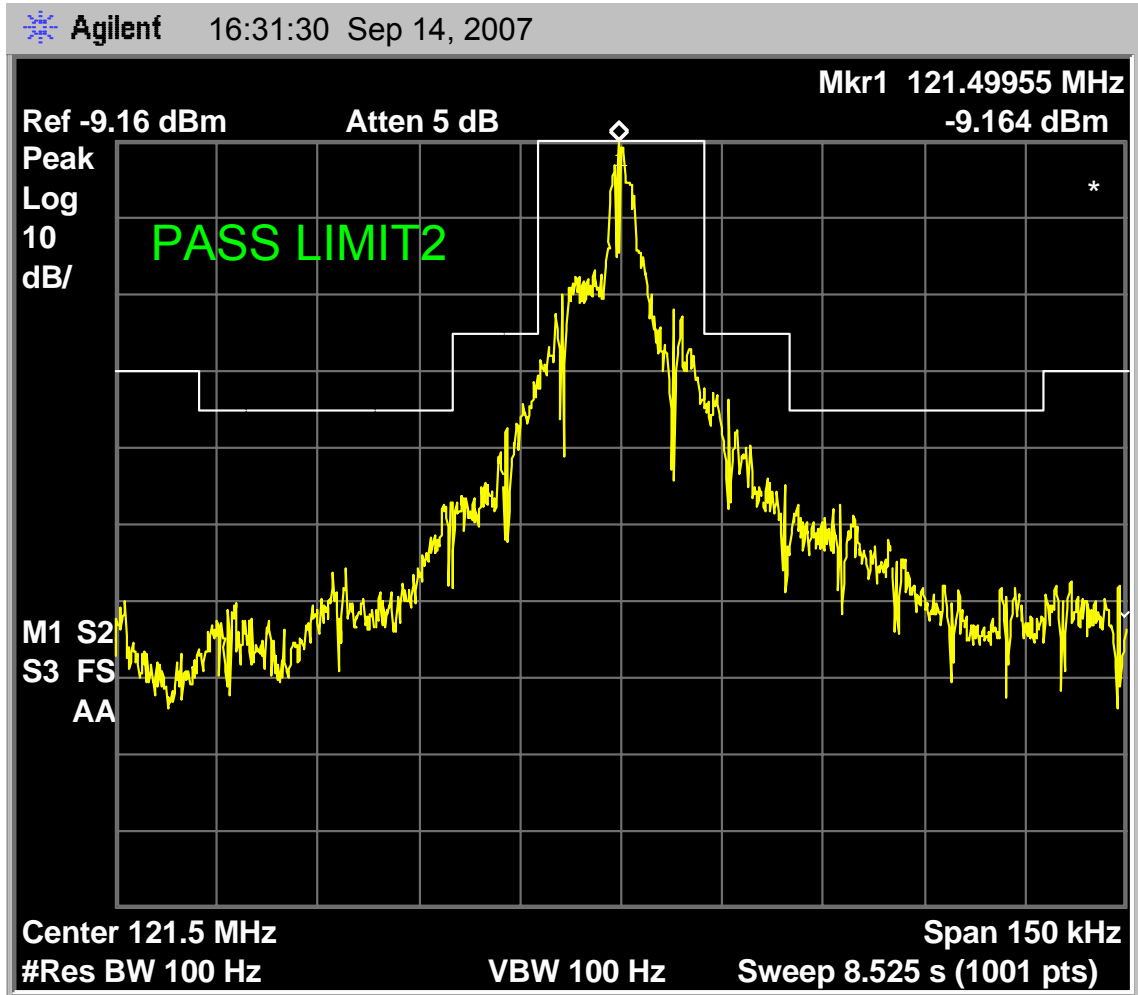
406 MHz Test at +55°C





Product Service

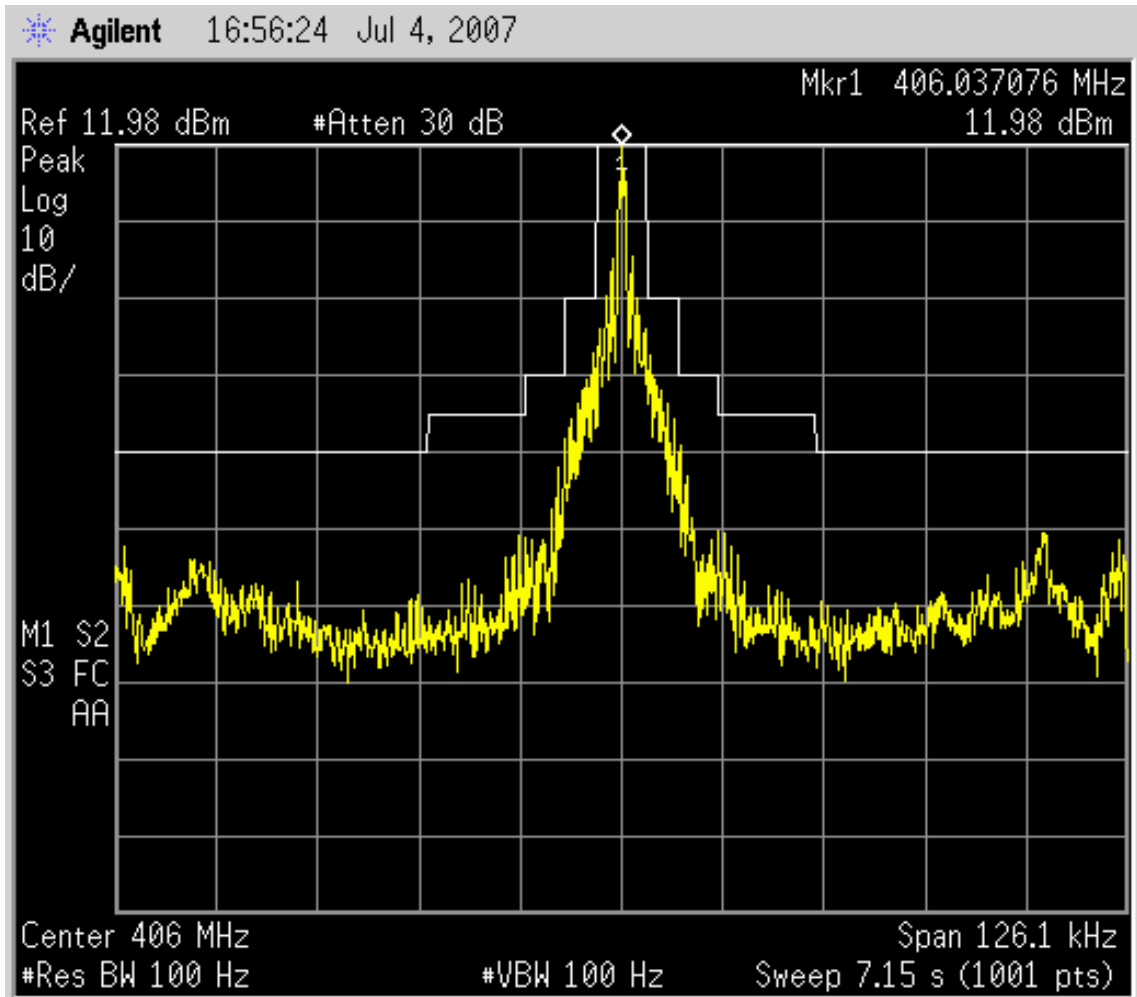
121 MHz Test at +55°C





Product Service

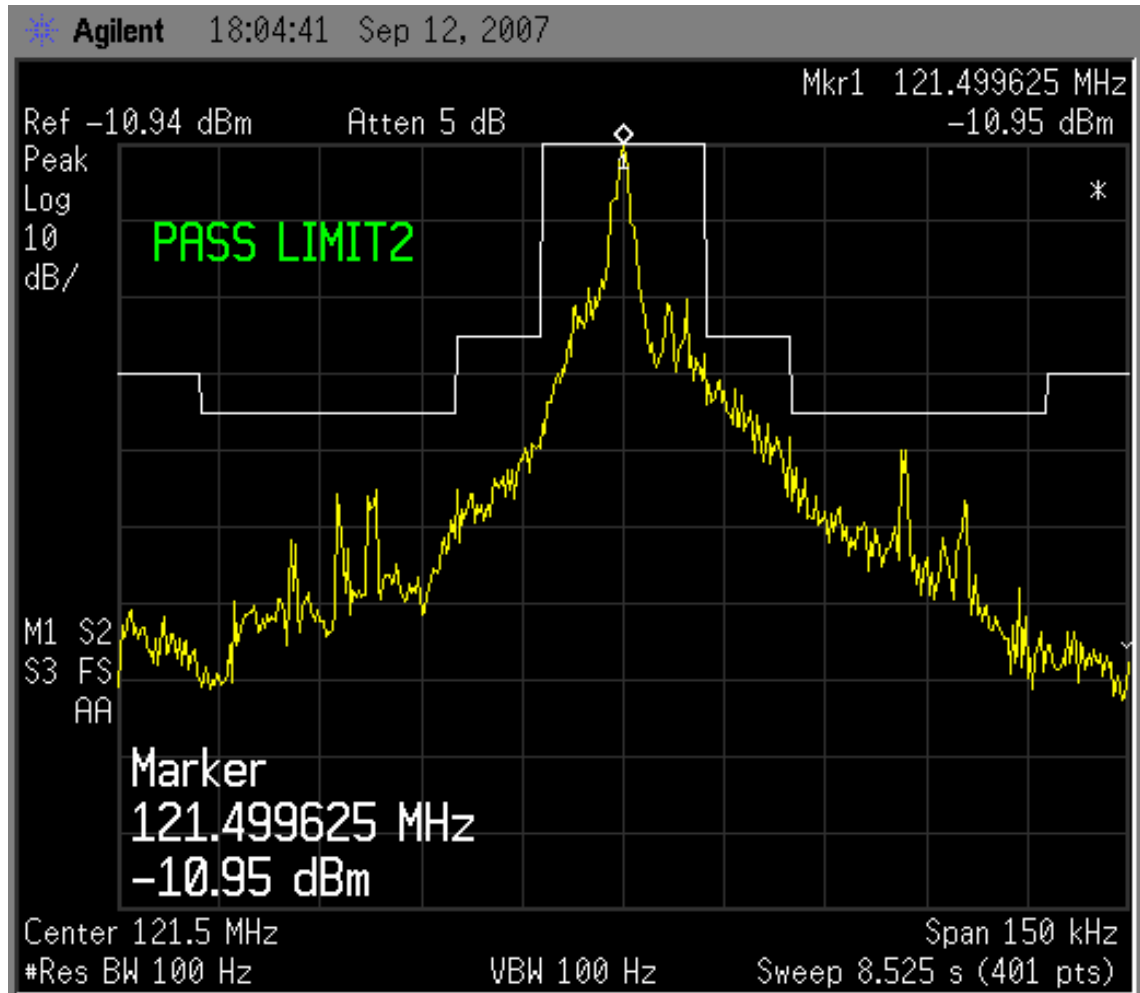
406 MHz Test at -20°C





Product Service

121 MHz Test at -20°C





2.11 LOW-TEMPERATURE THERMAL SHOCK TEST

2.11.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A11.1

2.11.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 002

2.11.3 Date of Test and Modification State

11 September 2007 - Modification State 6

2.11.4 Test Equipment Used

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

2.11.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle ("Ready Condition")*

*Note: EUT activated (entered Operating mode automatically) on contact with water – see Test Results for details.



Test Set-up – Preconditioning



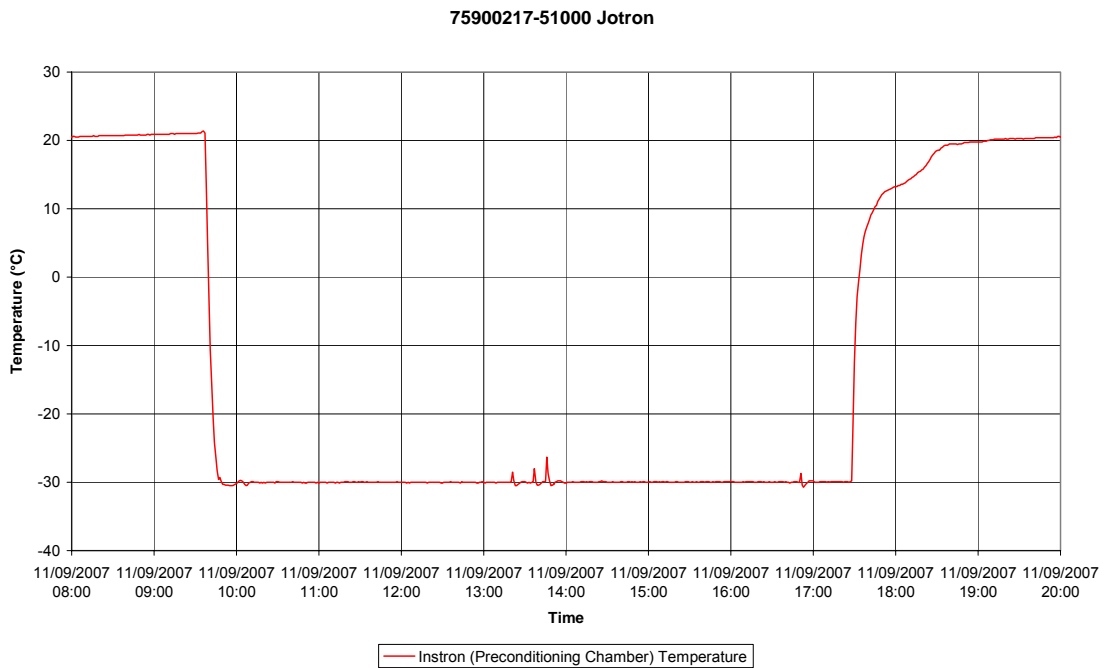
Product Service



Test Set-up – During Test

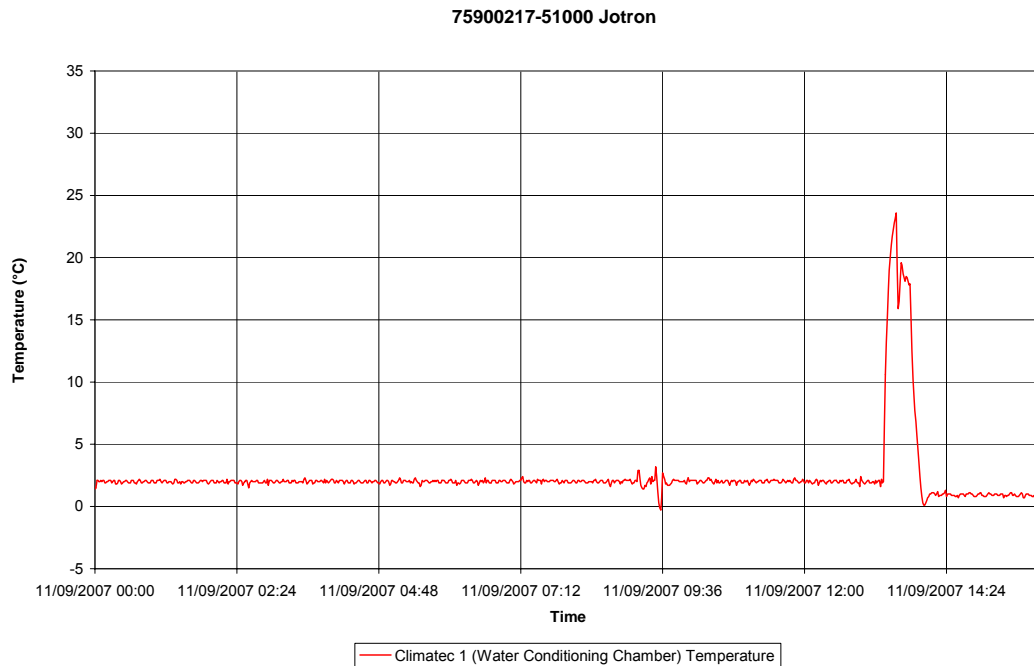
2.11.6 Environmental Conditions

Preconditioning Temperature Plot





Water Conditioning Temperature Plot



2.11.7 Test Results

EUT set to the Ready Condition and placed in the climatic chamber set to -30°C for a stabilisation of approximately 3 hours 30 minutes.

EUT removed from chamber and totally immersed in fresh water at 2.0°C for 10 seconds then allowed to float in the same water for a further 5 minutes. EUT activated but deactivated approximately one minute later.

EUT removed from water. Ice observed on self-activation contacts, ice removed from one of the contacts and EUT placed back into the water. EUT self-activated immediately and remained active for 5 minutes until EUT was removed from water.

EUT removed from water, dried and deactivated automatically then set to the Ready condition then replaced in the climatic chamber, chamber temperature still at -30°C .

EUT removed from chamber after stabilisation of approximately 3 hours 20 minutes and totally immersed in salt water at 1.6°C for 10 seconds then allowed to float in the same water. EUT self-activated immediately as it was immersed and an Aliveness Test was performed, see Beacon Test Report below.

After 20 minutes the following measurements were conducted (results can be found in the Test Results Table, starting on page 15):

- Short-term frequency stability
- Medium-term frequency stability
 - Mean slope
 - Residual frequency variation

EUT was removed from water, dried and deactivated.



Product Service

Beacon Test Report (Activation In Fresh Water)

Beacon Test Report

193DE847E0FFBFF

Organization:
Tested By:
Date: 11-Sep-07 1:26:34 PM
Tester Model/Serial No./File Name: BT100S/1025/00372-Cold-Fresh-1
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 26°C

PASS
 FAIL
 INITIALS: _____

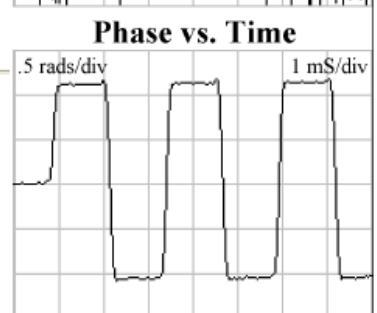
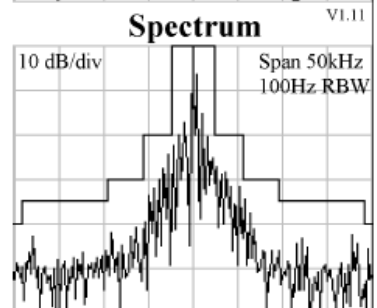
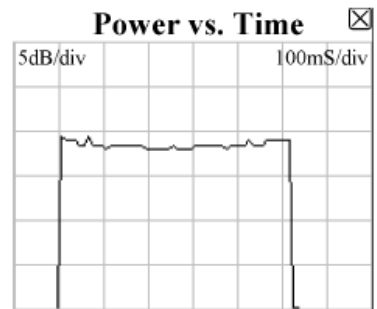
Notes: Add text comments here.

15 Hex ID: 193DE847E0FFBFF
Full Hex: FFFED08C9EF423F07FDFFA53F7F783E0F66C
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 201: Albania
Bits 41 - 64: 15999984

Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * * * * *
Longitude: * * * * *

406 MHz Measurements
406 Frequency (INT REF): 406.0371 MHz
406 Power (INT ANT): 64%
Power Rise Time: < 5 ms
Phase Deviation: -1.05 +1.13 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 117 uS
Modulation Symmetry: 0.4%
Modulation Bit Rate: 399.7 bps
CW Preamble: 160.6 ms

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.



Note: The "Tester Cal Due Date" is expired; this item of test equipment is "TU": Traceability Unscheduled.



Product Service

Beacon Test Report (Activation In Salt Water)

Beacon Test Report

193DE847E0FFBFF

Organization:

Tested By:

Date: 11-Sep-07 4:50:57 PM

Tester Model/Serial No./File Name: BT100S/1025/00372-Cold-Salt-EPIRB-1

Tester Cal Due Date: Nov 10, 2006

Tester Temperature: 28°C



PASS



FAIL

INITIALS: _____

Notes: Add text comments here.

15 Hex ID: 193DE847E0FFBFF

Full Hex: FFFE2F8C9EF423F07FDFFA53F7F783E0F66C

Burst Mode: Normal Mode (Long)

Protocol: Standard Test Protocol

Country 201: Albania

Bits 41 - 64: 15999984

Position Source: Internal GPS

Auxiliary Radio: 121.5 MHz

Bits 107-110: Default

Latitude: * * * * *

Longitude: * * * * *

406 MHz Measurements

406 Frequency (EXT REF): 406.036808 MHz

406 Power (INT ANT): 29%

Power Rise Time: < 5 ms

Phase Deviation: -0.93 +1.12 radians

Modulation Rise Time: 130 uS

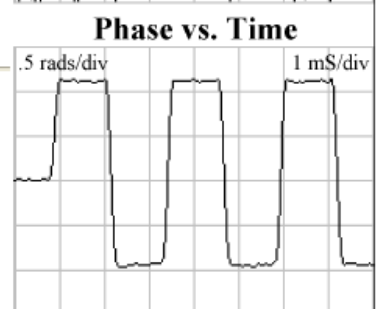
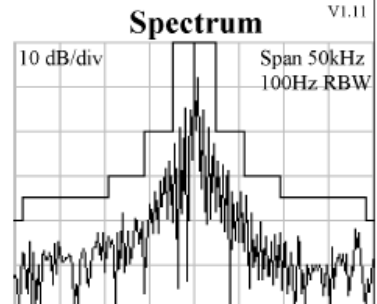
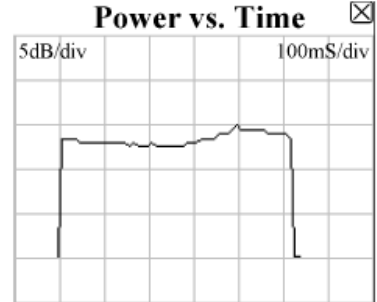
Modulation Fall Time: 142 uS

Modulation Symmetry: 0.8%

Modulation Bit Rate: 399.7 bps

CW Preamble: 161 ms

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.



Note: The "Tester Cal Due Date" is expired; this item of test equipment is "TU": Traceability Unscheduled.



Product Service

2.12 HIGH-TEMPERATURE THERMAL SHOCK TEST

2.12.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A11.1

2.12.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 002

2.12.3 Date of Test and Modification State

12 September 2007 - Modification State 6

2.12.4 Test Equipment Used

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

2.12.5 Test Set-up and Operating Modes

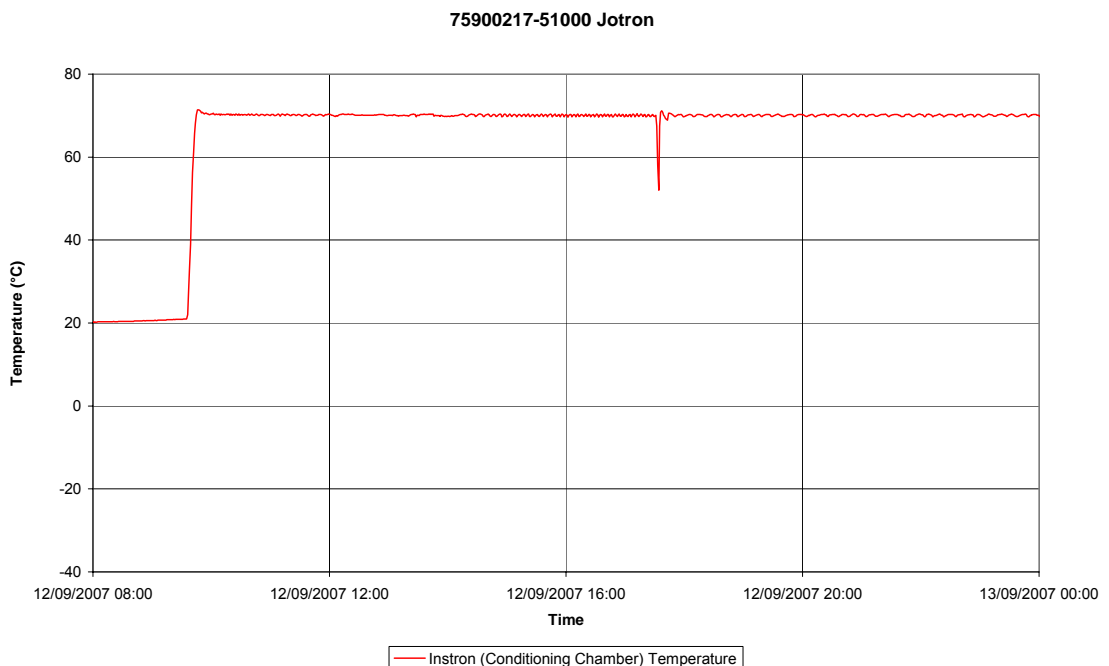
The test was performed with the EUT in the following mode(s): Idle ("Ready Condition")*

*Note: EUT activated (entered Operating mode automatically) on contact with water.

Physical test configuration: as per Low-Temperature Thermal Shock Test, above.

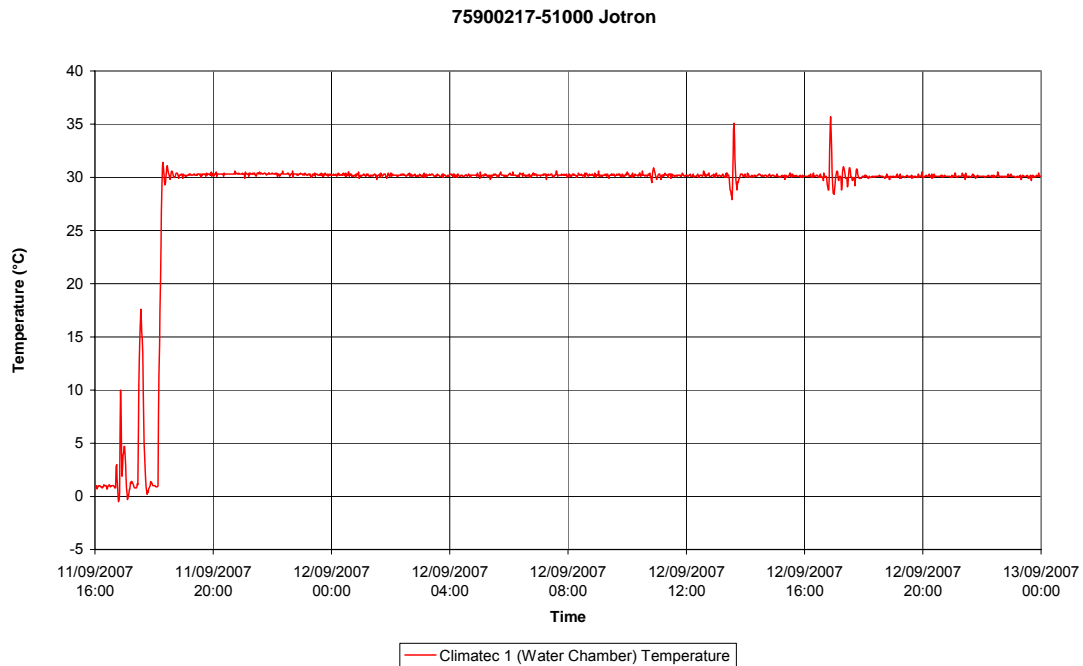
2.12.6 Environmental Conditions

Preconditioning Temperature Plot 1





Water Conditioning Temperature Plot 1



2.12.7 Test Results

EUT set to the Ready condition then placed in the climatic chamber. Chamber set to +70°C for a stabilisation of approximately 3 hours 40 minutes.

EUT removed from chamber and totally immersed in fresh water at 28.7°C for 10 seconds then allowed to float in the same water for a further 5 minutes. EUT self-activated immediately as it was immersed and an Aliveness Test was performed, see Beacon Test Report below.

EUT removed from water, dried and deactivated automatically then set to the Ready condition then replaced in the climatic chamber, chamber temperature still +70°C.

EUT removed from chamber after stabilisation of approximately 3 hours 10 minutes and totally immersed in salt water at 29.0°C for 10 seconds then allowed to float in the same water. EUT self-activated immediately as it was immersed and an Aliveness Test was performed, see Beacon Test Report below.

After 20 minutes the following measurements were conducted (results can be found in the Test Results Table, starting on page 15):

- Short-term frequency stability
- Medium-term frequency stability
 - Mean slope
 - Residual frequency variation

EUT was removed from water, dried and deactivated.



Product Service

Beacon Test Report (Aliveness Test, In Fresh Water)

Beacon Test Report

193DE847E0FFBFF

Organization:
Tested By:
Date: 12-Sep-07 1:26:54 PM
Tester Model/Serial No./File Name: BT100S/1025/00217-Shock-Hot-1
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 27°C

PASS FAIL INITIALS:

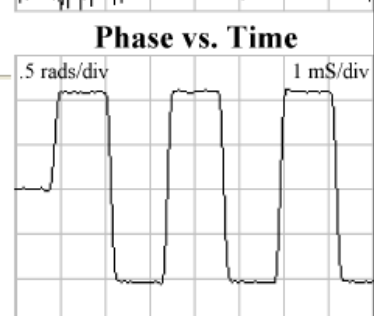
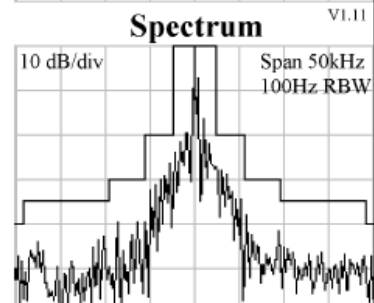
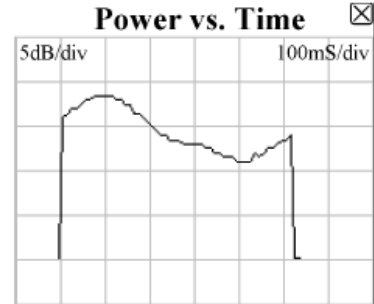
Notes: Add text comments here.

15 Hex ID: 193DE847E0FFBFF
Full Hex: FFFED08C9EF423F07FDFFA53F7F7
Burst Mode: Self Test Mode (Short)
Protocol: Standard Test Protocol
Country 201: Albania
Bits 41 - 64: 15999984

Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * * * * *
Longitude: * * * * *

406 MHz Measurements
406 Frequency (INT REF): 406.0371 MHz
406 Power (INT ANT): 41%
Power Rise Time: < 5 ms
Phase Deviation: -1.03 +1.09 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0.4%
Modulation Bit Rate: 399.7 bps
CW Preamble: 160.7 ms

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.



Note: The "Tester Cal Due Date" is expired; this item of test equipment is "TU": Traceability Unscheduled.



Product Service

Beacon Test Report (Aliveness Test, In Salt Water)

Beacon Test Report

193DE847E0FFBFF

Organization:
 Tested By:
 Date: 12-Sep-07 4:47:33 PM
 Tester Model/Serial No./File Name: BT100S/1025/00217-Hot-Salt-1
 Tester Cal Due Date: Nov 10, 2006
 Tester Temperature: 29°C

PASS FAIL INITIALS: _____

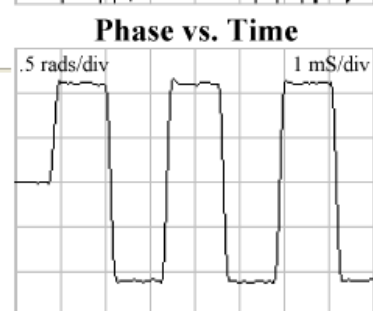
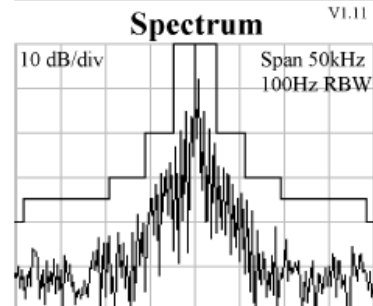
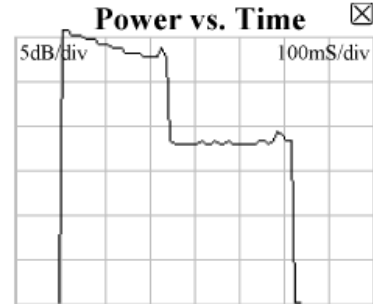
Notes: Add text comments here.

15 Hex ID: 193DE847E0FFBFF
 Full Hex: FFFE2F8C9EF423F07FDFFA53F7F7
 Burst Mode: Normal Mode (Short)
 Protocol: Standard Test Protocol
 Country 201: Albania
 Bits 41 - 64: 15999984

Position Source: Internal GPS
 Auxiliary Radio: 121.5 MHz
 Bits 107-110: Default
 Latitude: * * * * *
 Longitude: * * * * *

406 MHz Measurements
 406 Frequency (INT REF): 406.0372 MHz
 406 Power (INT ANT): 81%
 Power Rise Time: < 5 ms
 Phase Deviation: -1.09 +1.1 radians
 Modulation Rise Time: 130 uS
 Modulation Fall Time: 130 uS
 Modulation Symmetry: 0.4%
 Modulation Bit Rate: 399.7 bps
 CW Preamble: 160.7 ms

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.



Note: The "Tester Cal Due Date" is expired; this item of test equipment is "TU": Traceability Unscheduled.



Product Service

2.13 OPERATIONAL LIFE TEST

2.13.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A13.1

2.13.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.13.3 Date of Test and Modification State

16 to 20 August 2007 - Modification State 6

2.13.4 Test Equipment Used

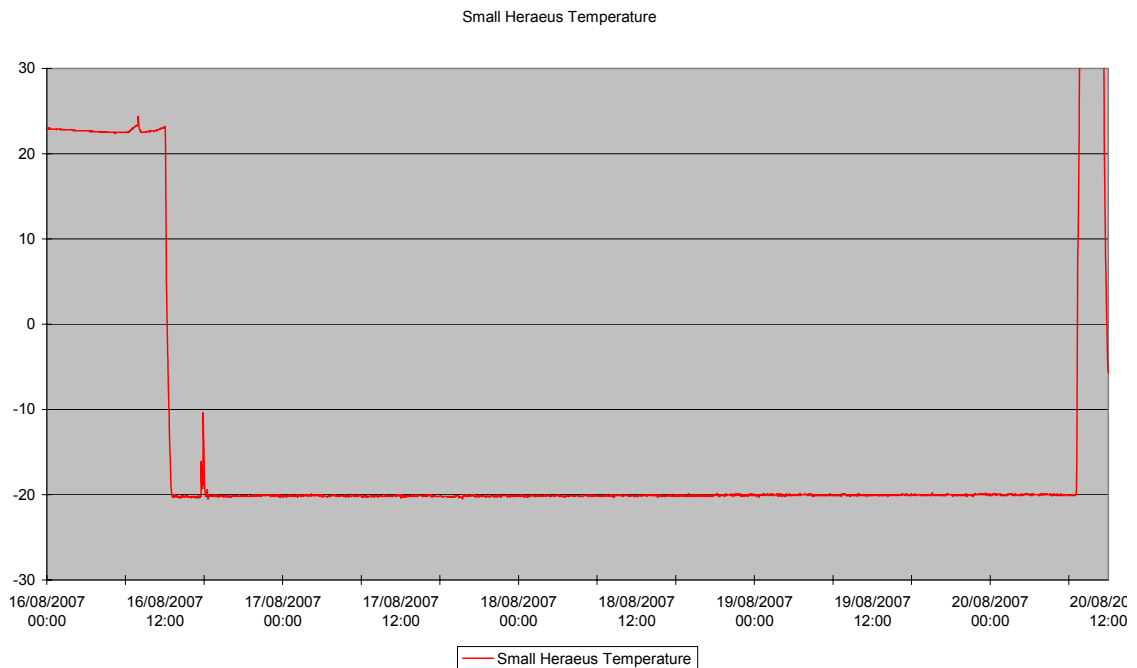
The major items of test equipment used for the above tests are identified in Section 3.1.

2.13.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Operating

2.13.6 Environmental Conditions

Temperature Plot





Product Service

2.13.7 Pre-Test 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 : 30 minutes (1799920 ms)
- Self-test Current : 7.92 seconds (7920 ms)
- Operating Current : 30 minutes (1799920 ms)

Assumptions / Supplied Data

- Battery Replacement Interval* : 5 years * "Expiry Date"
- Useful Battery Life : 10 years
- Battery Capacity : 7.2 Ah
- Battery Self Drain : 3.00 % per year
- Self-test Interval : 12 tests per year

Test Results

- Mode Current = Accumulated Charge / Time
- Standby Current = 1195585605 pC / 1799920 ms = 664.24 nA
- Self-test Current = 905591.2 uC / 7920 ms = 114.34 mA
- Operating Current = 121755156 uC / 1799920 ms = 67.64 mA

Battery Preconditioning / Discharge Time Calculations

- Battery Self Drain = Capacity - [(100% - Self Drain/Year%)^{Replacement Interval} x Capacity]
 = 7.2 - ((1 - 0.0300)¹⁰ x 7.2) = 1.8905 Ah
- Standby Drain = Hours per year x Battery Replacement Interval x Standby Current
 = 365 x 24 x 5 x 664.24 x 10⁻⁹ = 0.0291 Ah
- Self-test Drain = Self-tests per battery x Self-test Current x Self-test duration (in hours)
 = 12 x 5 x 114.34 x 10⁻³ x (7.92 / 3600) = 0.0151 Ah
- Total Drain = Self Drain + Standby Drain (Worst Case) + Self-test Drain (Worst Case)
 = 1.8905 + 0.0291 + 0.0151 = 1.9347 Ah

Battery Preconditioning / Discharge Time = Worst Case drain / Operational Current
 = 1.9347 / (67.64 x 10⁻³)
 = 28.60 hours

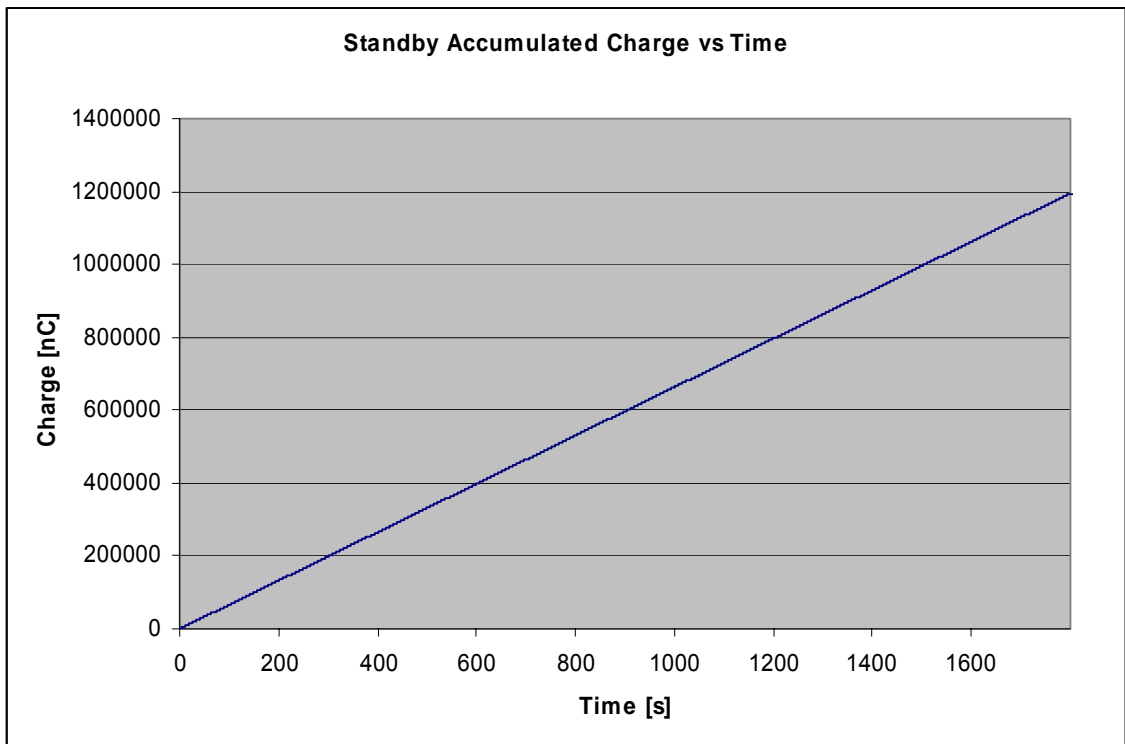
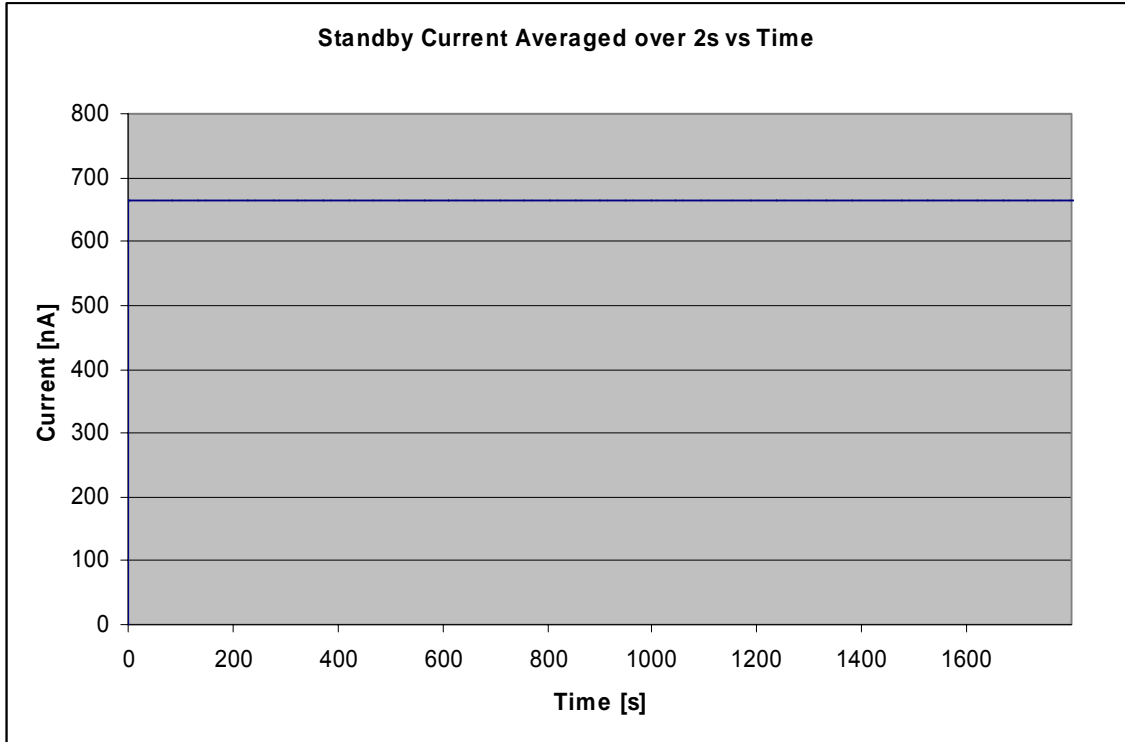


Product Service

Note: Beacon was only discharged for 16.11 hours as test was run in conjunction with operational life time test under CS T.007 hence 12.49 hours (28.60 – 16.11) must be removed from the “Time to First Failure” in order to get Equivalent Operational Lifetime Duration.

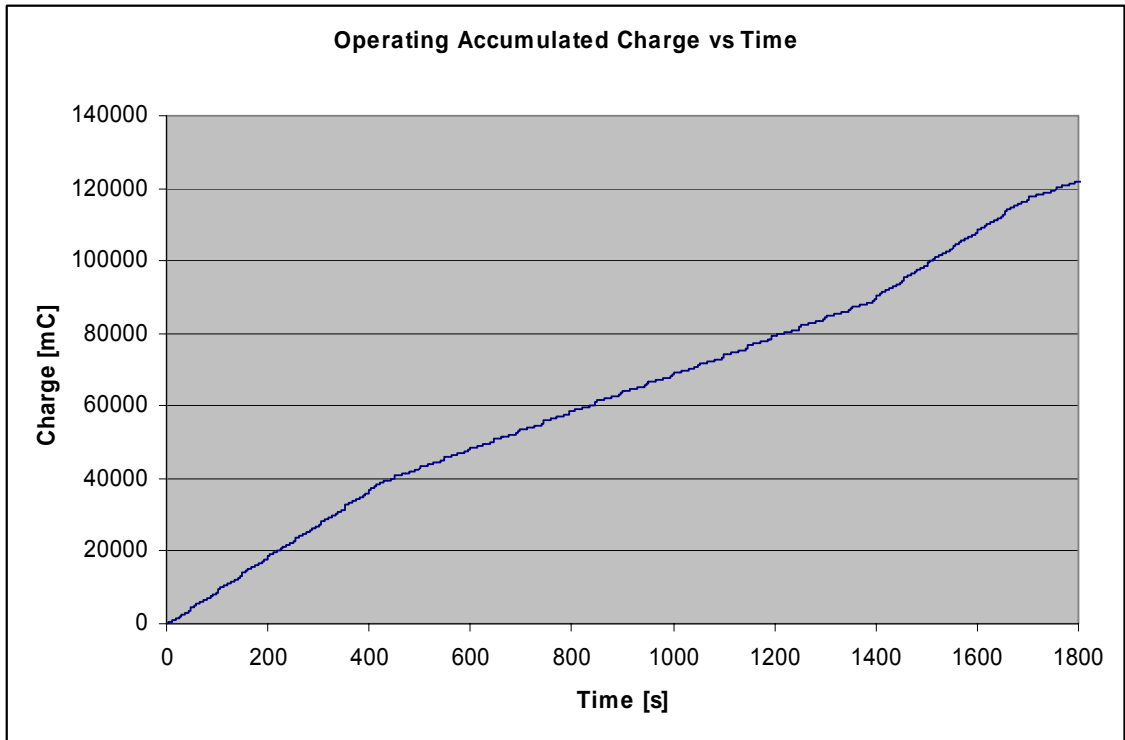
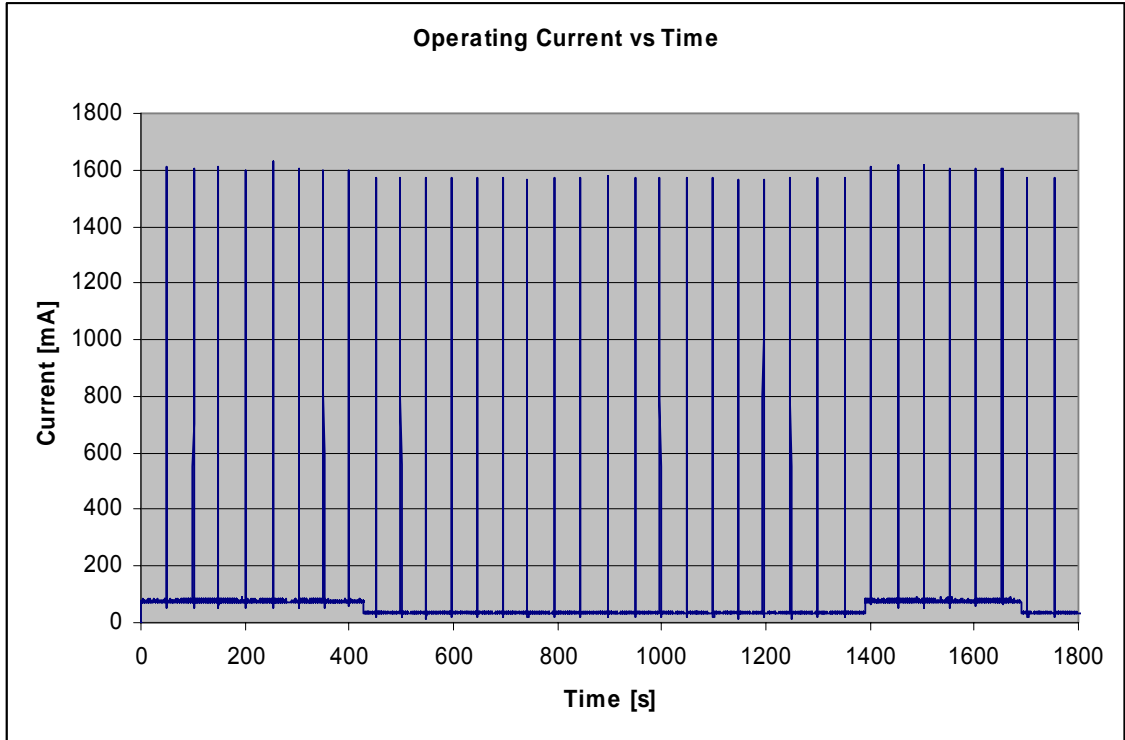


Battery Current Measurement Results – Standby Current



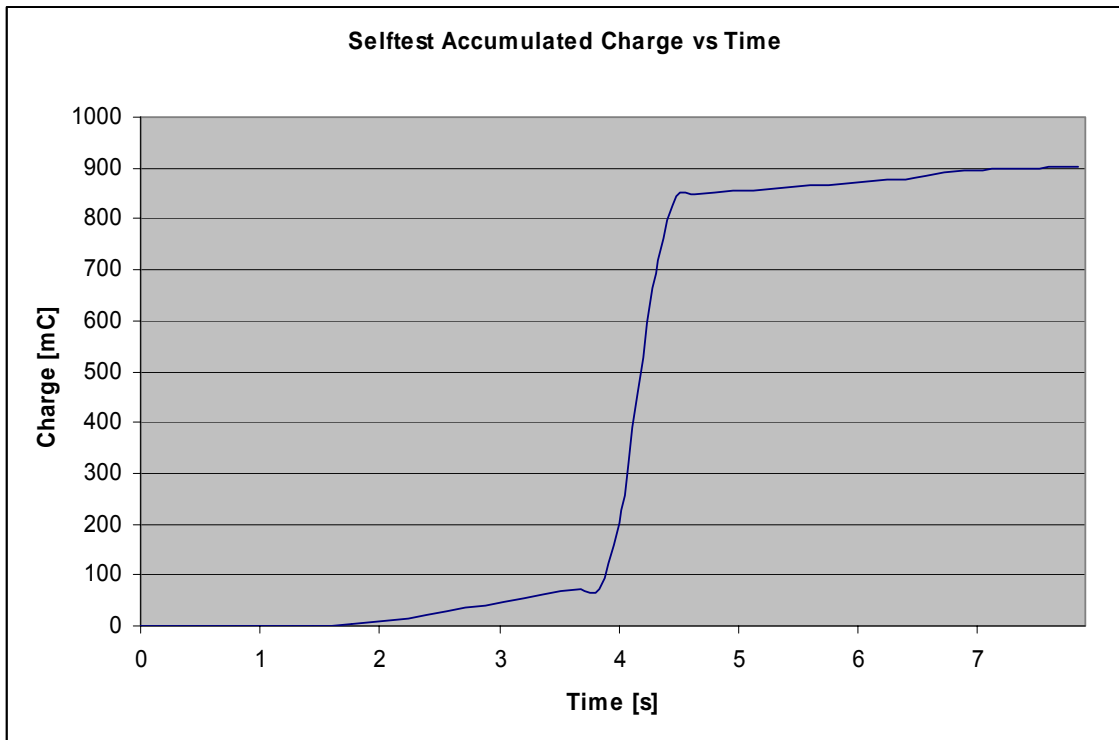
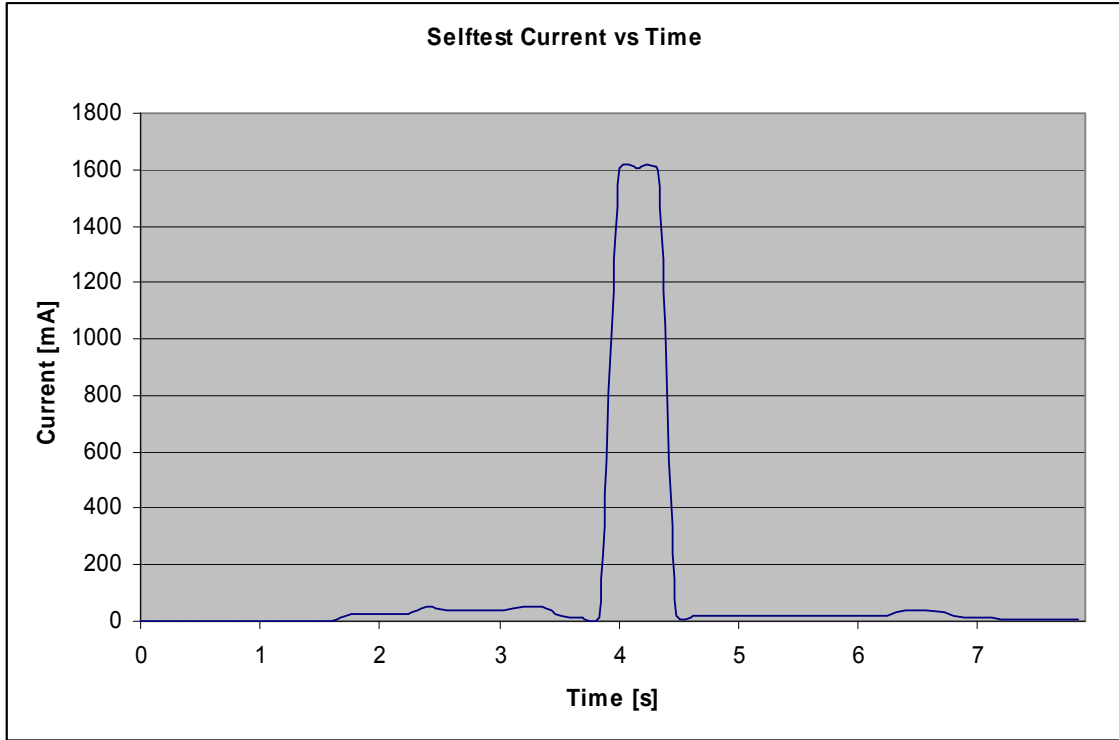


Battery Current Measurement Results- Operating Current





Battery Current Measurement Results – Self-test Current

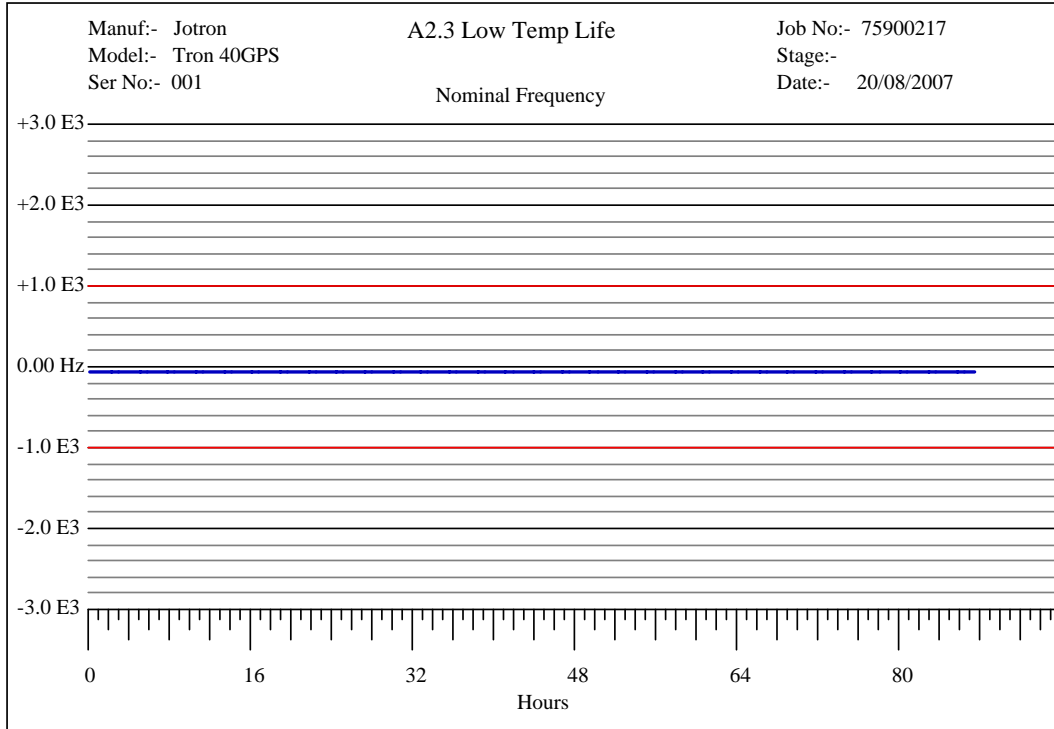




Product Service

2.13.8 Test Results

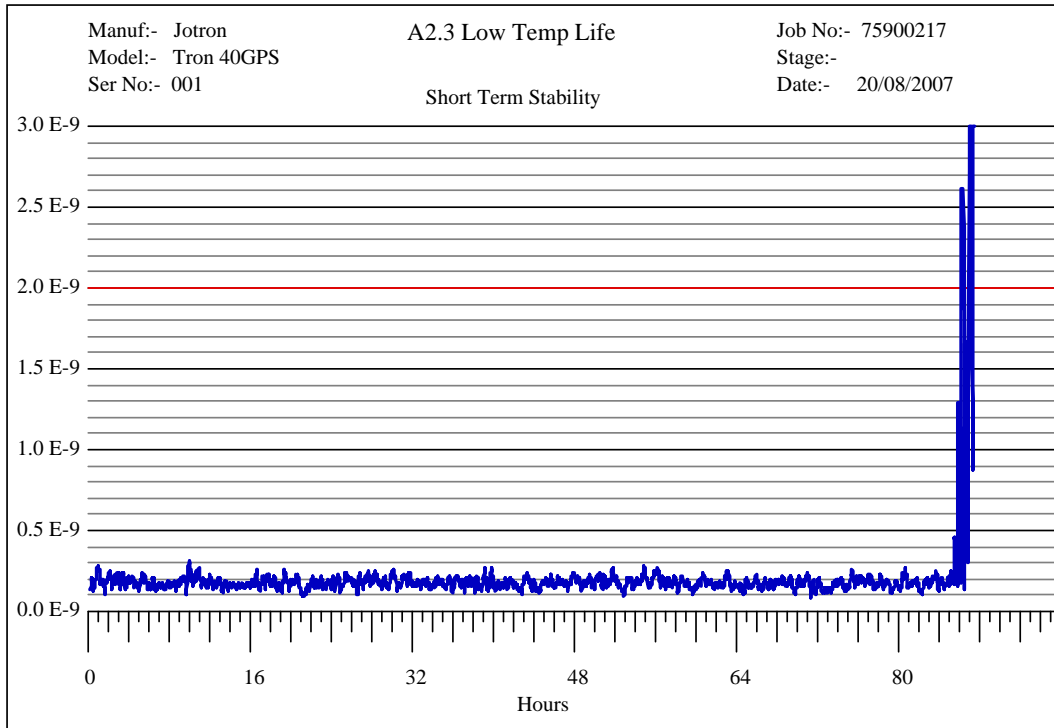
406 MHz Test Results



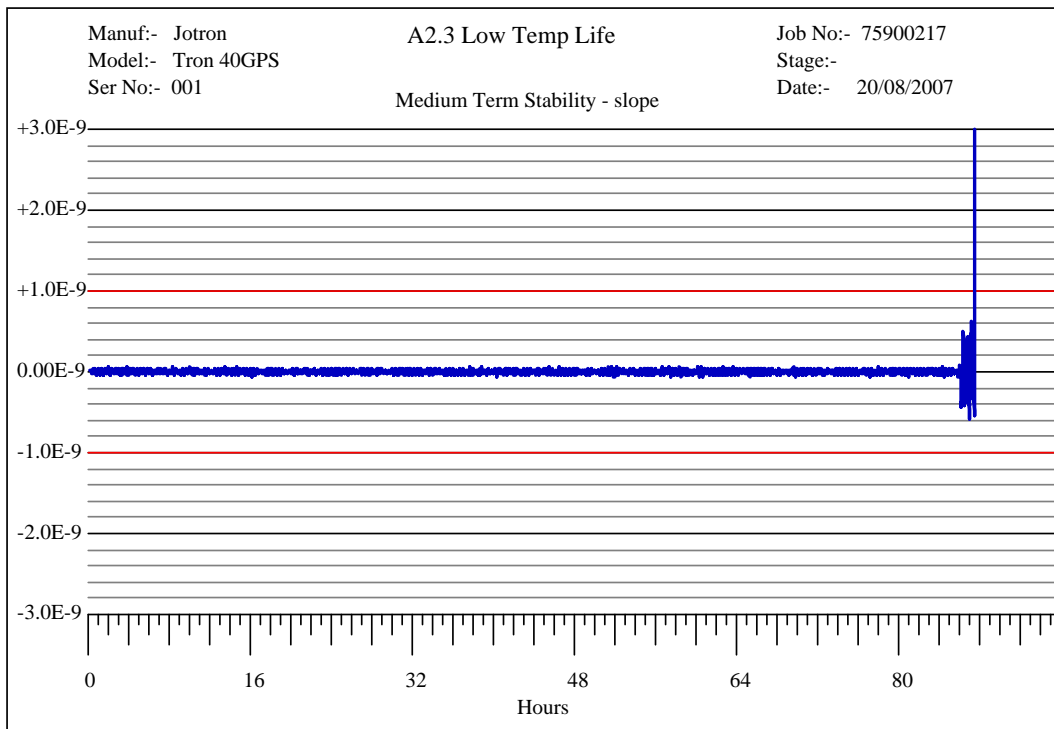
Nominal Frequency Offset



Product Service



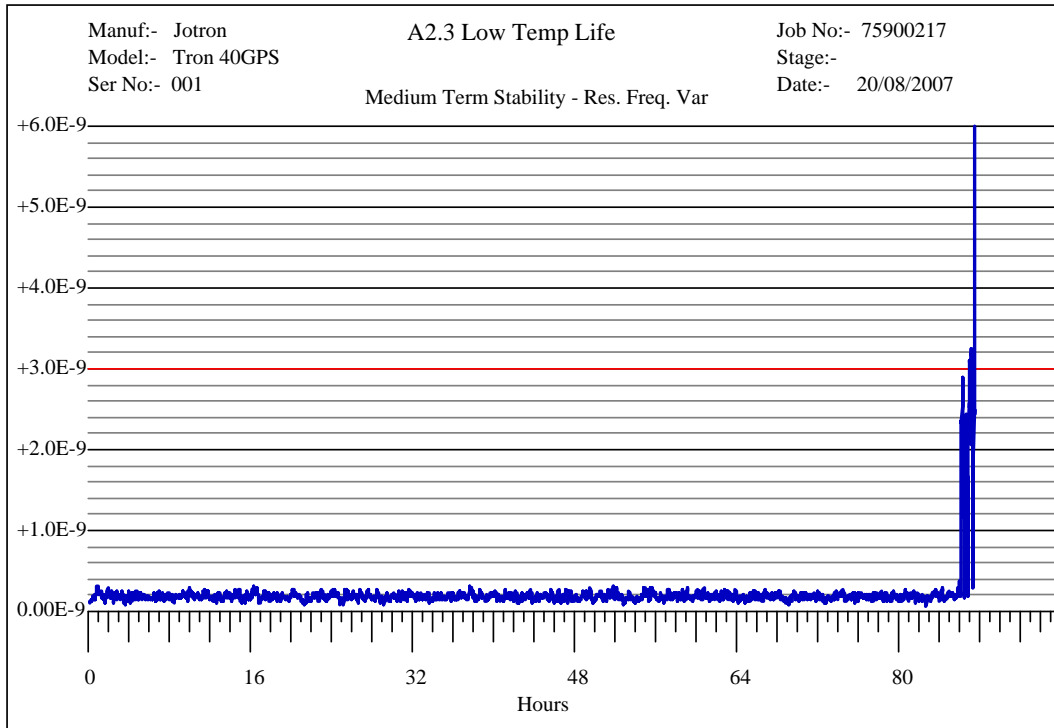
Short Term Stability



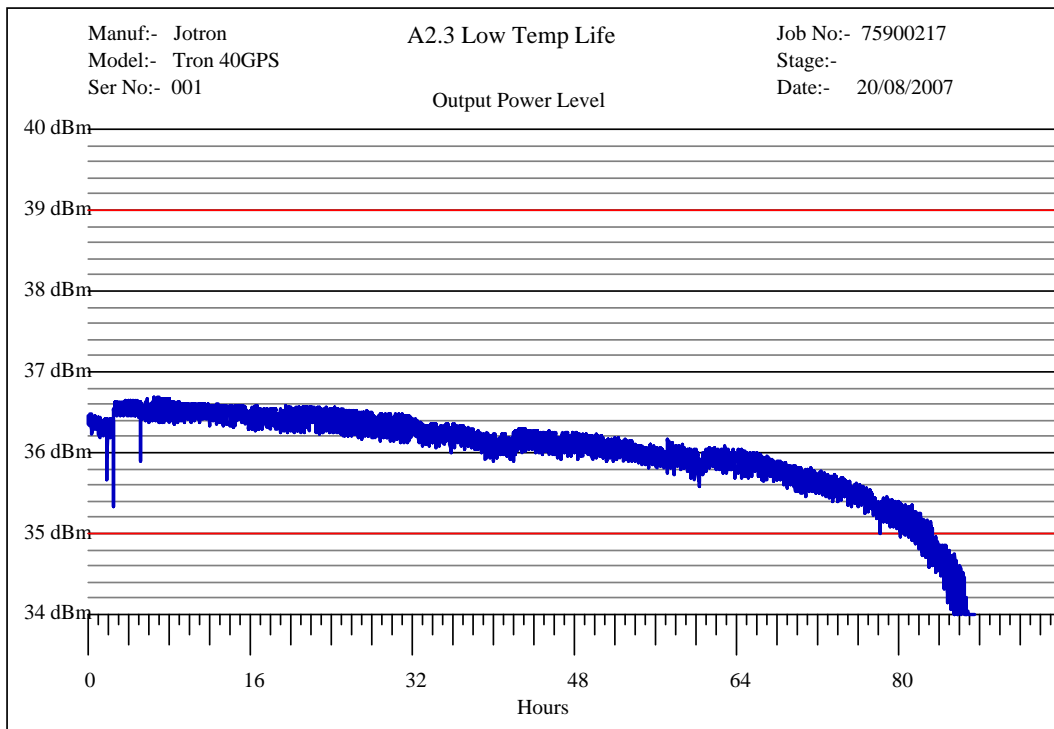
Medium Term Stability – Slope



Product Service



Medium Term Stability – Residual Frequency Variation



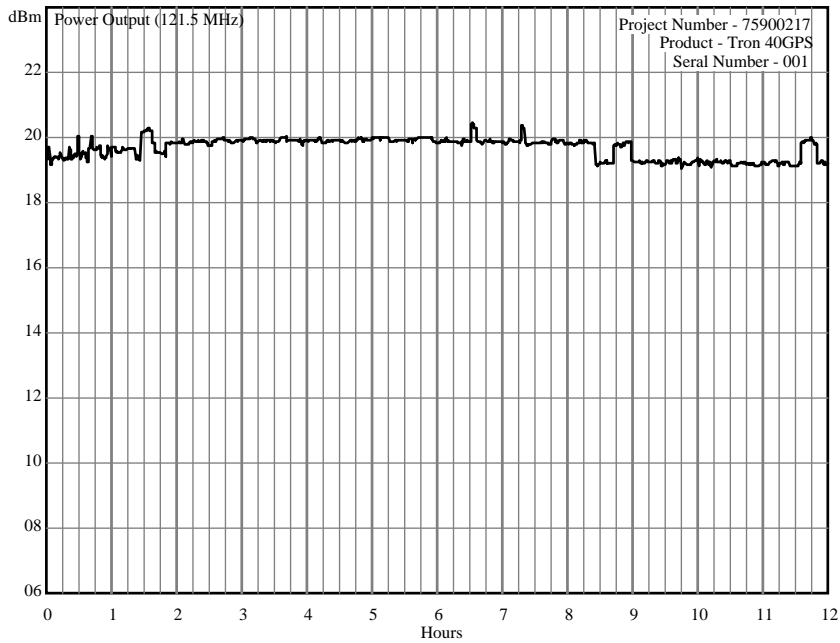
Output Power



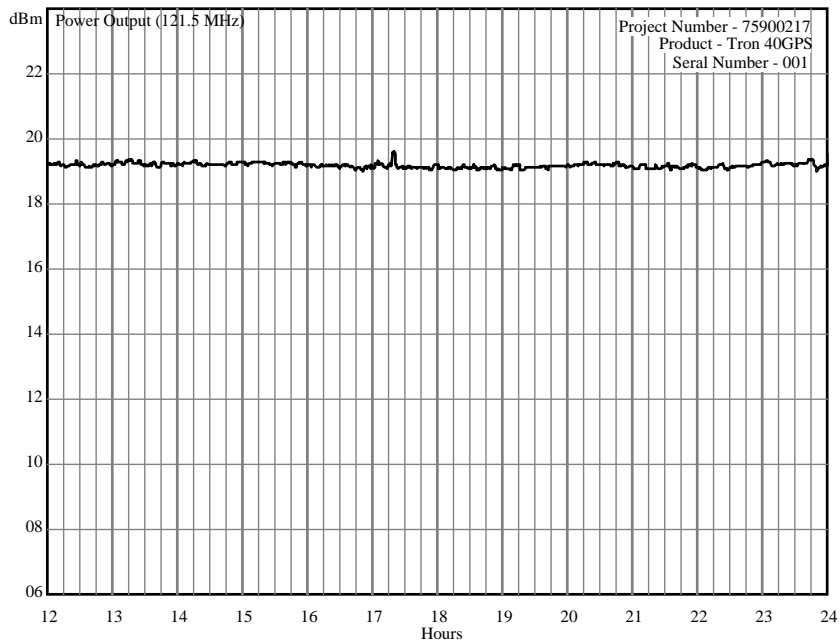
Product Service

121 MHz Test Results (Auxiliary Radio-locating Device Peak Envelope Output Power)

Summary of results can be found in the Test Results Table, starting on page 15.



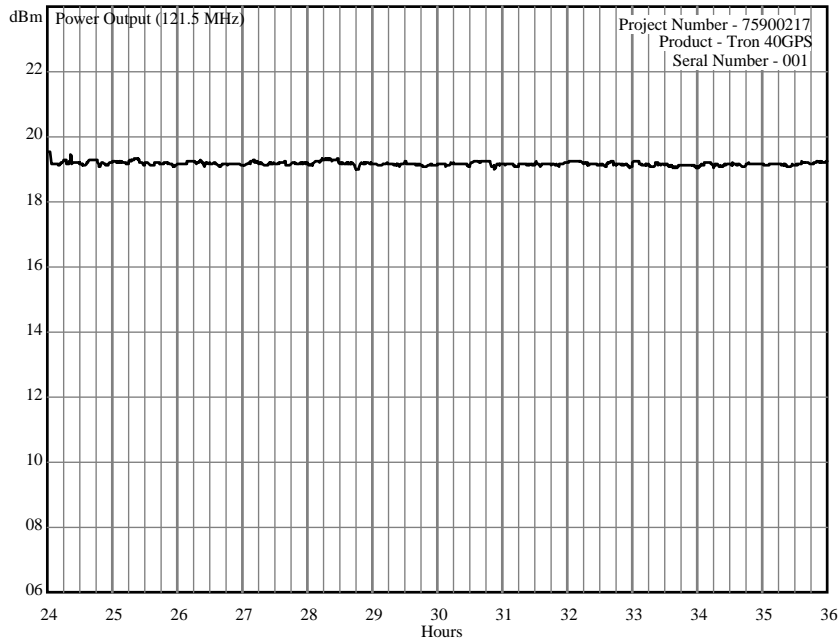
PEOP Graph 1



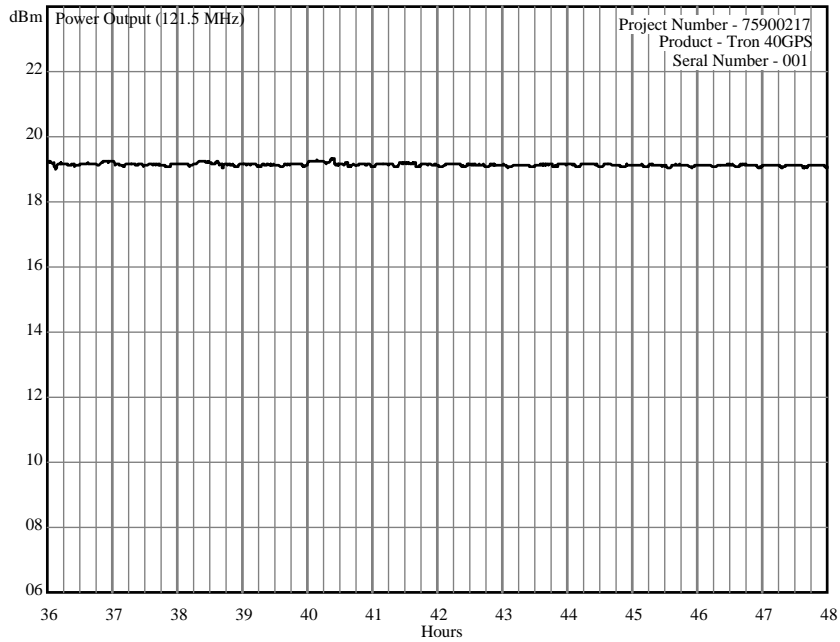
PEOP Graph 2



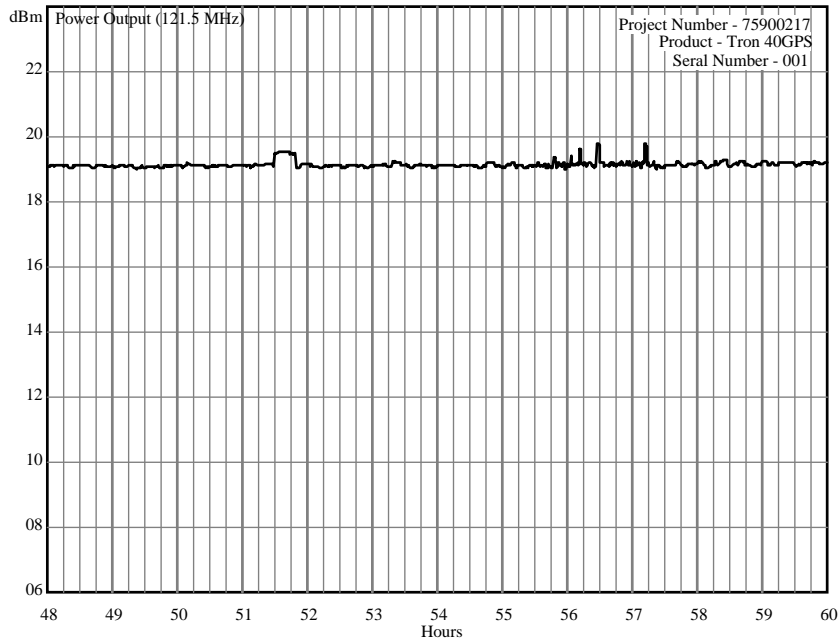
Product Service



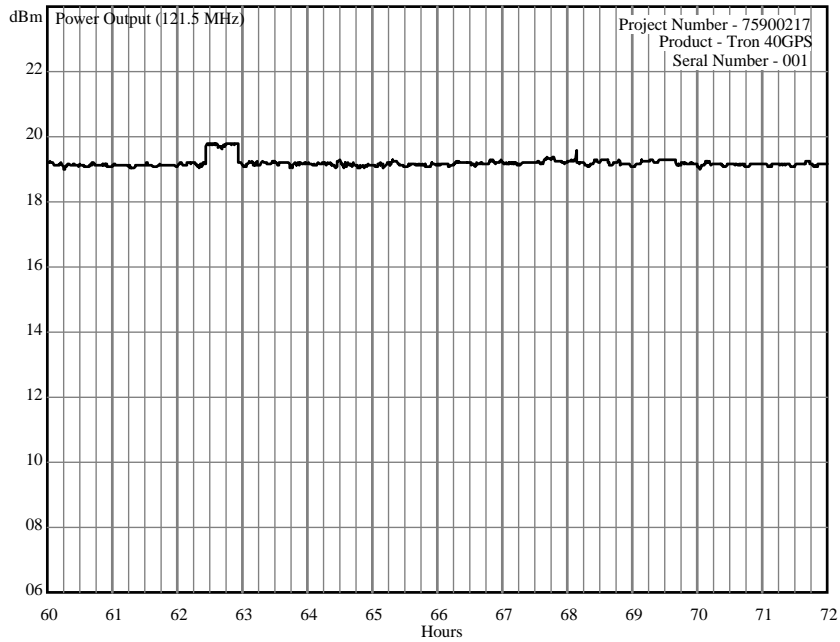
PEOP Graph 3



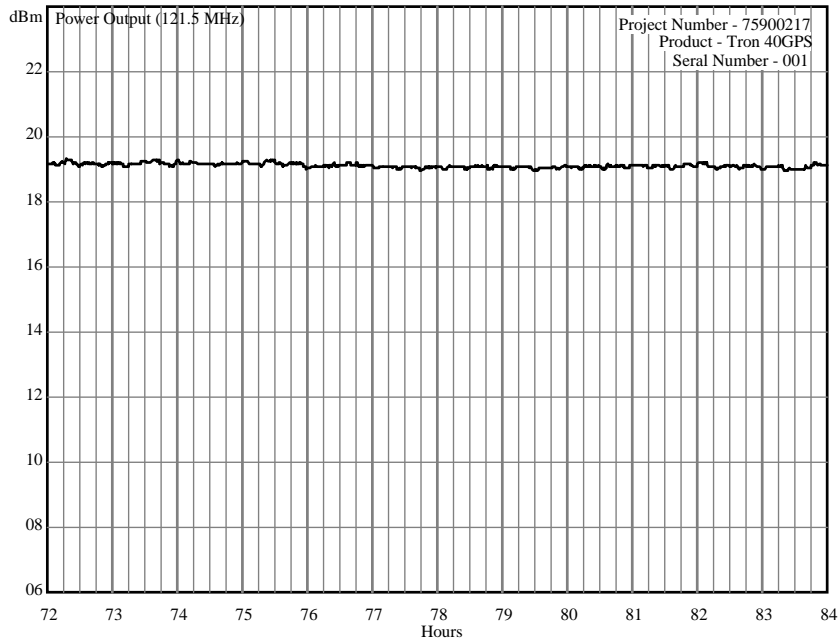
PEOP Graph 4



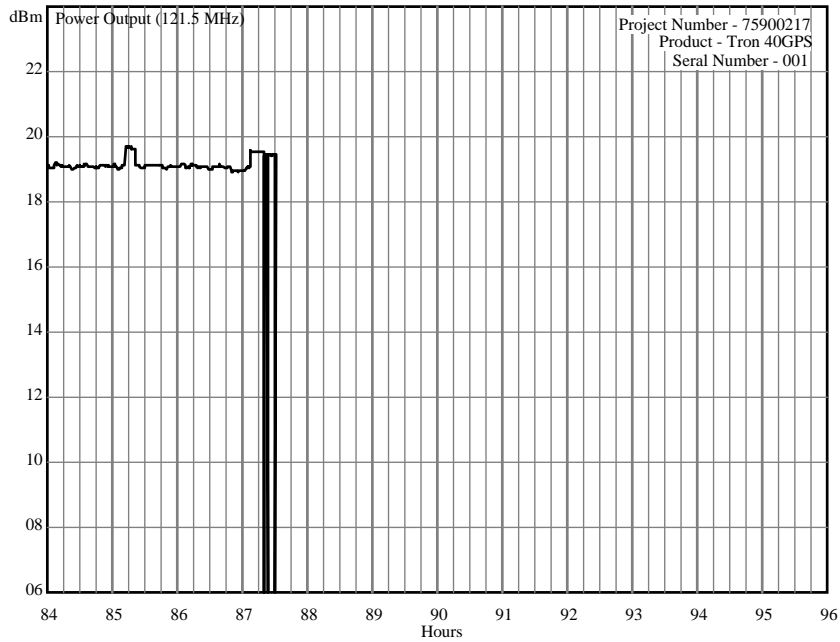
PEOP Graph 5



PEOP Graph 6



PEOP Graph 7



PEOP Graph 8



Product Service

2.14 STROBE LIGHT TEST

2.14.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A13.2

2.14.2 Test Results

Test completed as per customer supplied information, see Annex A.



Product Service

2.15 SELF-TEST

2.15.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A13.2

2.15.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.15.3 Date of Test and Modification State

Test at Ambient:	30 August 2007	- Modification State 6
Test at +55°C:	17 September 2007	- Modification State 7
Test at -20°C:	12 September 2007	- Modification State 7

2.15.4 Test Equipment Used

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

2.15.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Operating and Self-test as per "Specification Reference", above.

2.15.6 Environmental Conditions

	30 th August 2007
Ambient Temperature	22.0°C
Atmospheric Pressure	1017mbar

2.15.7 Test Procedure

EUT Stabilised for greater than 3 hours, EUT turned on and Aliveness Test performed. EUT main switch returned to the ready position for a minimum of 5 minutes. EUT turned on again and measurements performed.

2.15.8 Test Results

Summary of Aliveness test/Self-test results

Stage	Pass / Fail
Ambient Aliveness Test	Pass
Ambient Self-test	Pass
High Temperature (+55°C) Aliveness Test	Pass
High Temperature (+55°C) Self-test	Pass
Low Temperature (-20°C) Aliveness Test	Pass
Low Temperature (-20°C) Self-test	Pass



Product Service

Self-test Results

Parameter	Units	Test Results		
		T _{min} (-20°C)	T _{amb}	T _{max} (+55°C)
Pulse duration	ms	520.2609	520.2706	520.2208
Frame sync pattern	9 binary bits	0 1101 0000	0 1101 0000	0 1101 0000
Number of bursts	number	1	1	1
15 Hex ID	15 hexadecimal bits	992D4 0018C 001E9	992D4 0018C 001E9	992D4 0018C 001E9



Product Service

2.16 AUTOMATIC RELEASE MECHANISM AND AUTOMATIC ACTIVATION TESTS

2.16.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A14.0

2.16.2 Test Results

Test completed as per customer supplied information, see Annex A for information.



Product Service

2.17 STABILITY AND BUOYANCY TEST

2.17.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A15.0

2.17.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 002

2.17.3 Date of Test and Modification State

16 February 2007- Modification State 1

2.17.4 Test Equipment Used

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

2.17.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle*

*Note: EUT activated (entered Operating mode automatically) on contact with water.



Test Set-up



Product Service

2.17.6 Environmental Conditions

Ambient Temperature	22.2°C
Relative Humidity	31%
Atmospheric Pressure	1004mbar
Water Temperature	11.2°C

2.17.7 Test Procedure

Stability

The EUT was submerged just below the surface of the aforementioned tank of fresh water with the antenna in a horizontal position (parallel with the water's surface). The EUT was released and allowed to float freely. The time for the EUT to pass through the vertical position was checked to be less than 2 seconds.

Buoyancy

The EUT was strapped with cable ties to create a central fixing point at the base of the unit. A large tank was filled with domestic tap water and a 20Kg mass with a pulley attachment was submerged therein.

Completely submerging the EUT into the tank the unit was held under the surface with a rope tied to the fixing point, running through the pulley and attached to a force gauge held by the Test Engineer. The pulley converted the buoyant (upwards) force to an equal force at an angle coaxial with the force gauge.

Antenna Height

Completed by customer declaration.

2.17.8 Test Results

Stability

EUT passed through the upright position in less than 1 second.

Uprightness

The EUT was immersed in calm fresh water as shown in the following photograph and floated upright.



EUT Immersed In Fresh Water

Antenna Height

Test passed as per customer supplied information, see Annex A for information.

Reserve Buoyancy

EUT mass = 1.994 Kg

EUT weight = 19.56 N

Buoyant forces measured were 10.3, 8.3, 8.5, 10.3 and 10.9 N

Mean = 9.66N

Reserve buoyancy = $\frac{\text{Buoyant Force}}{\text{Weight}}$ = $\frac{9.66}{19.56}$

Reserve buoyancy = 0.494



Product Service

2.18 INADVERTENT ACTIVATION TEST

2.18.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A16.0

2.18.2 Test Results

Test completed as per customer supplied information, see Annex A for information.



Product Service

2.19 CARRIER FREQUENCY TEST**2.19.1 Specification Reference**

RTCM Paper 77-2002/SC110-STD, Clause A17.1

2.19.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.19.3 Date of Test and Modification State

Test at +55°C:	14 September 2007	- Modification State 7
Test at -20°C:	13 September 2007	- Modification State 7

2.19.4 Test Equipment Used

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

2.19.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Operating

2.19.6 Test Procedure

The EUT was connected to the automated test rack and the following results were obtained.

2.19.7 Test Results

Parameter	Units	Test Results	
		T _{min} (-20°C)	T _{max} (+55°C)
Carrier Frequency	MHz	121.4997666	121.4997202



Product Service

2.20 MODULATION CHARACTERISTICS (TRANSMITTER DUTY CYCLE)

2.20.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A17.2

2.20.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.20.3 Date of Test and Modification State

Test at +55°C: 14 September 2007 - Modification State 7
 Test at -20°C: 12 September 2007 - Modification State 7

2.20.4 Test Equipment Used

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

2.20.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Operating

2.20.6 Test Procedure

Using an oscilloscope the 121MHz transmission was observed, the transmission duration and interruption duration were observed. the interruption duration was checked to be less than 2 seconds and the Transmitter Duty Cycle was calculated using the following formula:

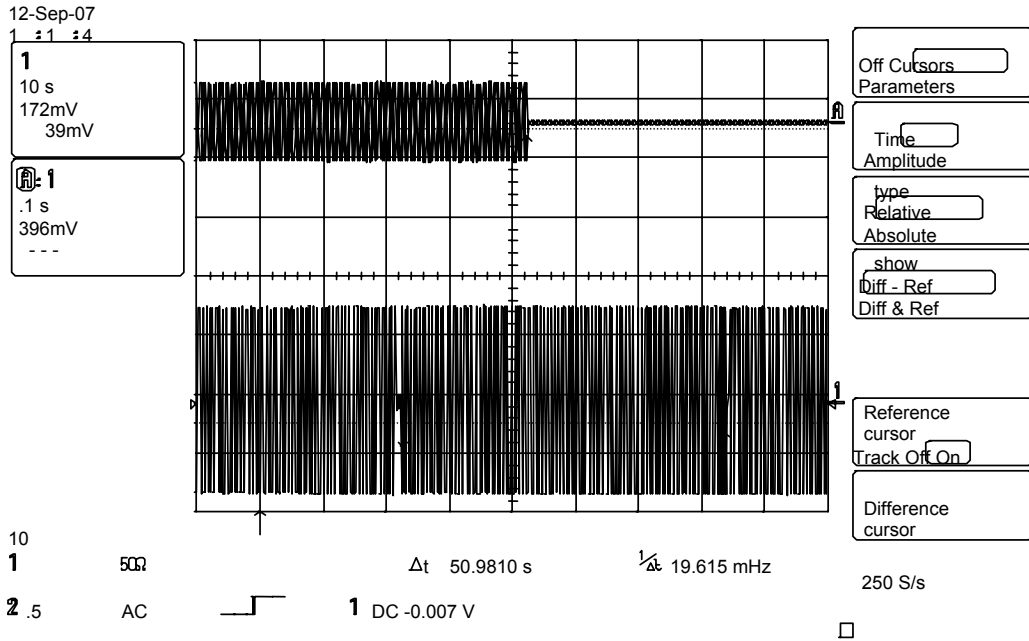
$$\text{Transmitter Duty Cycle} = \frac{\text{Transmission Duration}}{\text{Transmission Duration} + \text{Transmission Interruption Duration}}$$

2.20.7 Test Results

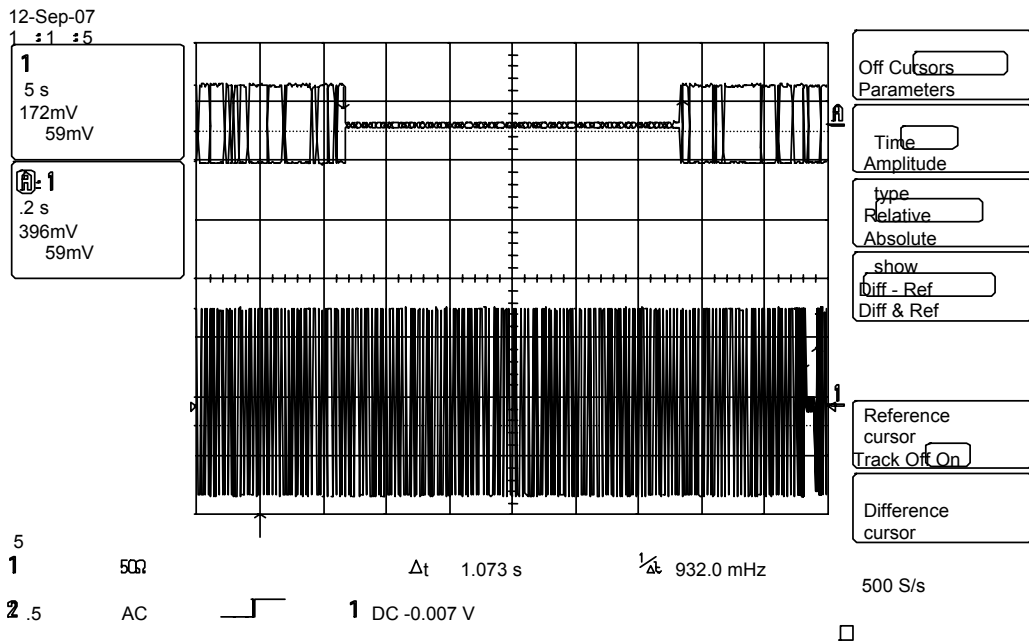
Parameter	Units	Test Results	
		T _{min} (-20°C)	T _{max} (+55°C)
121.5 MHz transmission duration	seconds	50.981	46.953
121.5 MHz transmission interruption duration	seconds	1.073	1.064
Transmitter Duty Cycle	%	97.9	97.8



Product Service



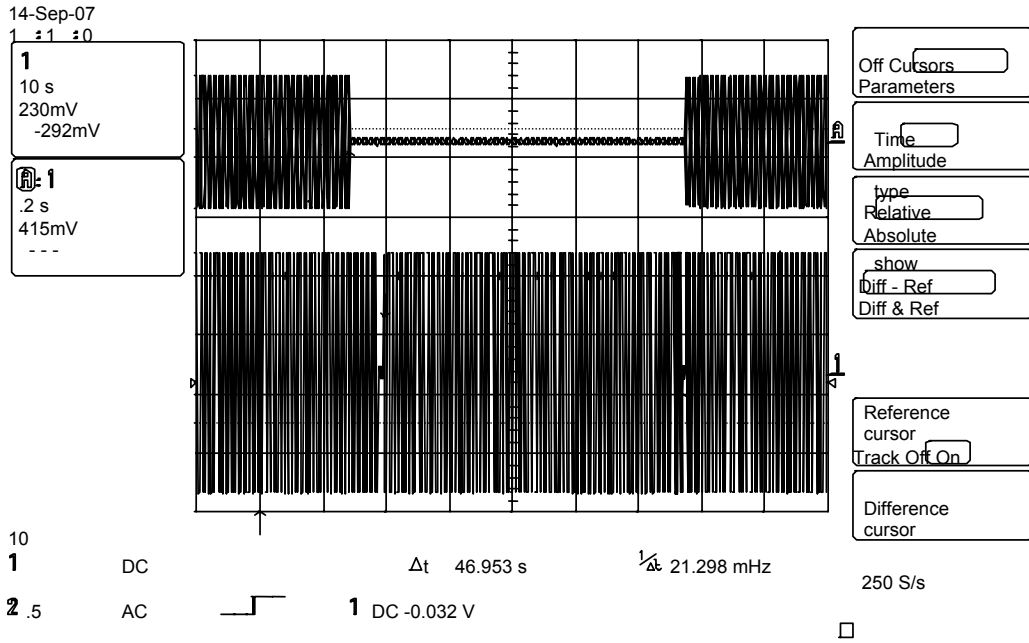
Plot showing 121.5MHz Transmission Duration (High Temperature, +55°C)



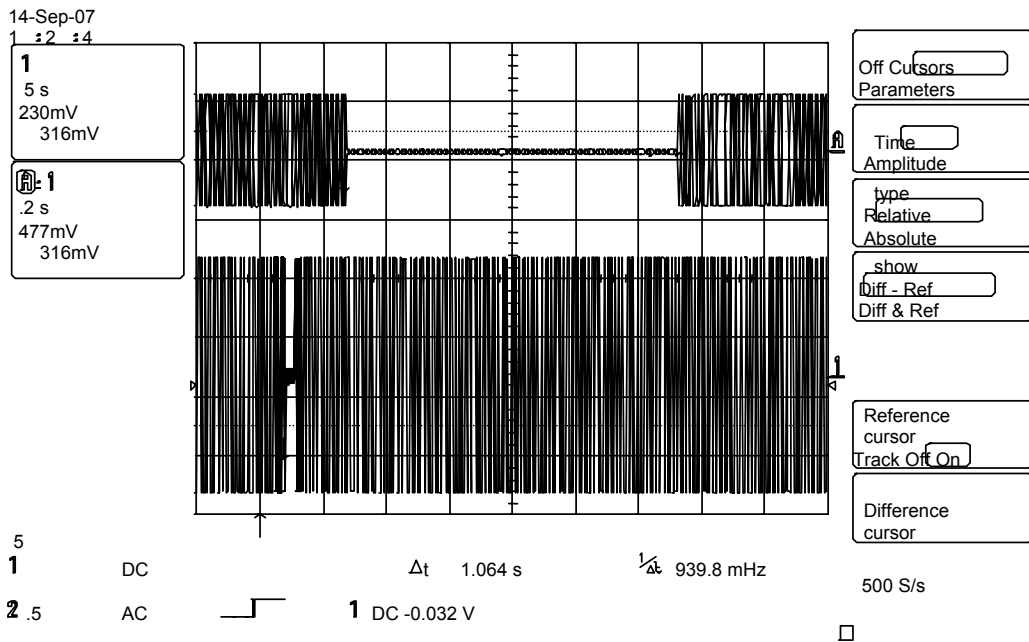
Plot showing 121.5MHz Transmission Interruption Duration (High Temperature, +55°C)



Product Service



Plot showing 121.5MHz Transmission Duration (Low Temperature, -20°C)



Plot showing 121.5MHz Transmission Interruption Duration (Low Temperature, -20°C)



Product Service

2.21 MODULATION CHARACTERISTICS (MODULATION FREQUENCY AND SWEEP REPETITION RATE, MODULATION DUTY CYCLE)

2.21.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A17.2

2.21.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.21.3 Date of Test and Modification State

Test at +55°C: 14 September 2007 - Modification State 7
 Test at -20°C: 13 September 2007 - Modification State 7

2.21.4 Test Equipment Used

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

2.21.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Operating

2.21.6 Test Procedure

The EUT was connected to the automated test rack and the following results were obtained.

2.21.7 Test Results

Parameter	Units	Test Results	
		T _{min} (-20°C)	T _{max} (+55°C)
Frequency Range	Hz	944.30	945.75
Minimum Frequency	Hz	387.30	385.36
Maximum Frequency	Hz	1331.6	1331.1
Sweep Direction	Upward / Downward	Downward	Downward
Modulation Duty Cycle	%	33.61	35.73
Sweep repetition rate	sweeps per second (Hz)	2.61	2.70



Product Service

2.22 MODULATION CHARACTERISTICS (MODULATION FACTOR)

2.22.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A17.2

2.22.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.22.3 Date of Test and Modification State

Test at +55°C: 14 September 2007 - Modification State 7
 Test at -20°C: 13 September 2007 - Modification State 7

2.22.4 Test Equipment Used

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

2.22.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Operating

2.22.6 Test Procedure

Using an oscilloscope the 121MHz transmission was observed; peak and trough voltages (“A” and “B” respectively) were measured. The Modulation Factor was then calculated using the following formula:

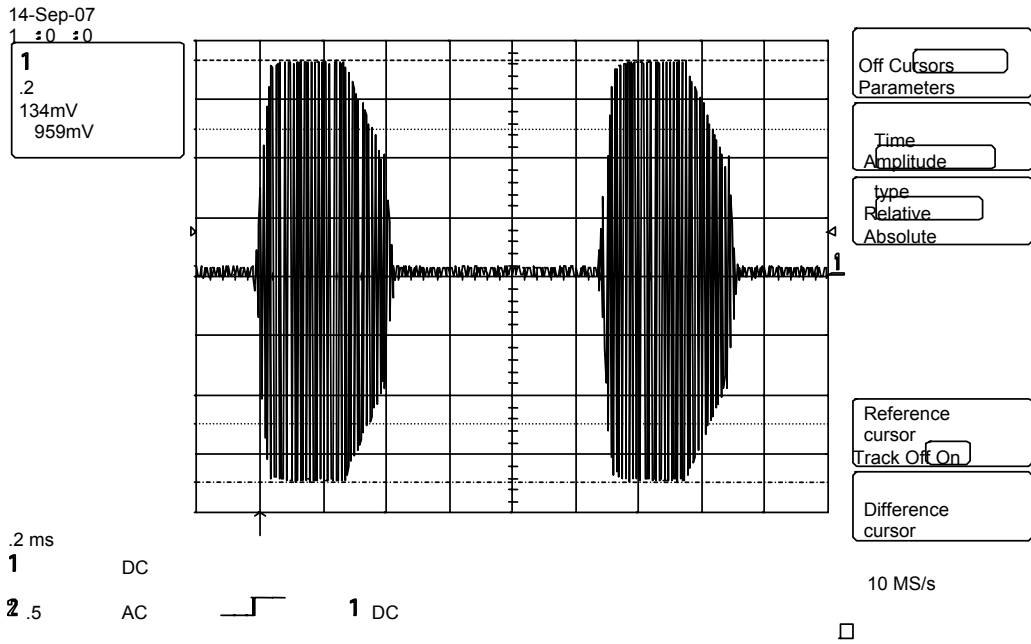
$$\text{Modulation Factor} = \frac{A - B}{A + B}$$

2.22.7 Test Results

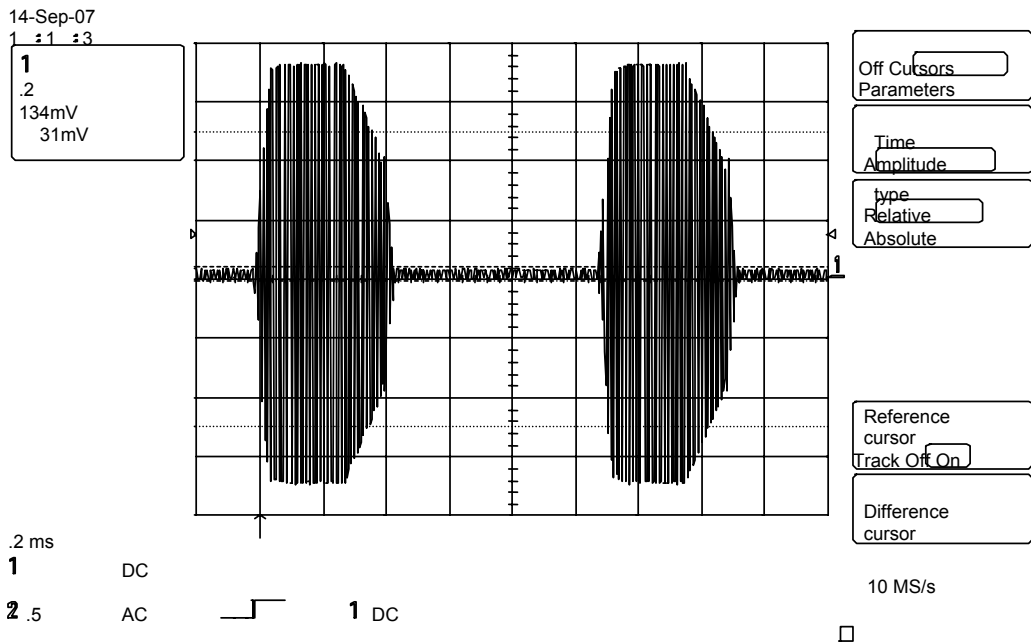
Parameter	Units	Test Results	
		T _{min} (-20°C)	T _{max} (+55°C)
A	mv	456	959
B	mv	31	31
Modulation Duty Cycle	%	87.3	93.7



Product Service



Plot showing "A" (High Temperature, +55°C)



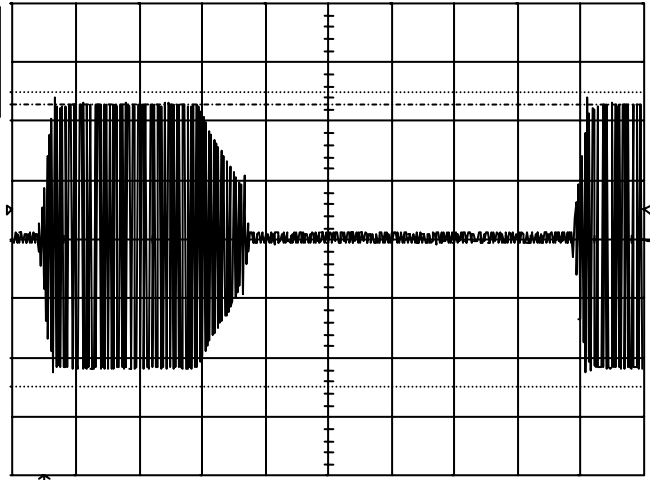
Plot Showing "B" (High Temperature, +55°C)



Product Service

13-Sep-07
16 : 32 : 39

1
.2 ms
200mV
456mV



.2 ms
1 .2 V DC
2 .5 V AC



1 DC 0.100 V

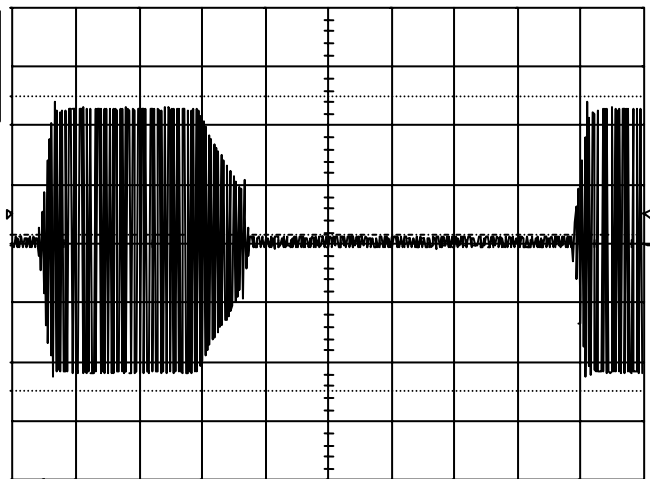
10 MS/s

STOPPED

Plot showing "A" (Low Temperature, -20°C)

13-Sep-07
16 : 34 : 35

1
.2 ms
200mV
31mV



.2 ms
1 .2 V DC
2 .5 V AC



1 DC 0.100 V

10 MS/s

STOPPED

Plot Showing "B" (Low Temperature, -20°C)



Product Service

2.23 MODULATION CHARACTERISTICS (FREQUENCY COHERENCE)

2.23.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A17.2

2.23.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.23.3 Date of Test and Modification State

Test at +55°C:	14 September 2007	- Modification State 7
Test at -20°C:	12 September 2007	- Modification State 7

2.23.4 Test Equipment Used

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

2.23.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Operating

2.23.6 Test Procedure

Using a spectrum analyser the 121MHz transmission was observed, using the “max hold” (peak hold) function combined with a “clear write” trace for instantaneous information on the timing of the 121MHz transmission cessation for 406MHz transmission.

The following test results were checked to show that 30% of the output power of the EUT lies within $\pm 30\text{Hz}$ of the carrier. The results were also checked for evidence that the carrier does not shift more than $\pm 30\text{Hz}$ when 121MHz transmission resumes after the 406MHz burst.

The modulation was disabled by means of a dipswitch on the EUT main PCB for the purposes of this test.

2.23.7 Test Results

The following plots show that 30% of the output power of the EUT does lie within $\pm 30\text{Hz}$ of the carrier.

The frequency drift plots (with two traces) show the outline of the transmitted RF (121.5 MHz) before and after the interruption for the 406 MHz RF burst. It can be seen that the peaks are less than $\pm 30\text{Hz}$ from one another. I.e. carrier did not shift by more than $\pm 30\text{Hz}$.



Product Service

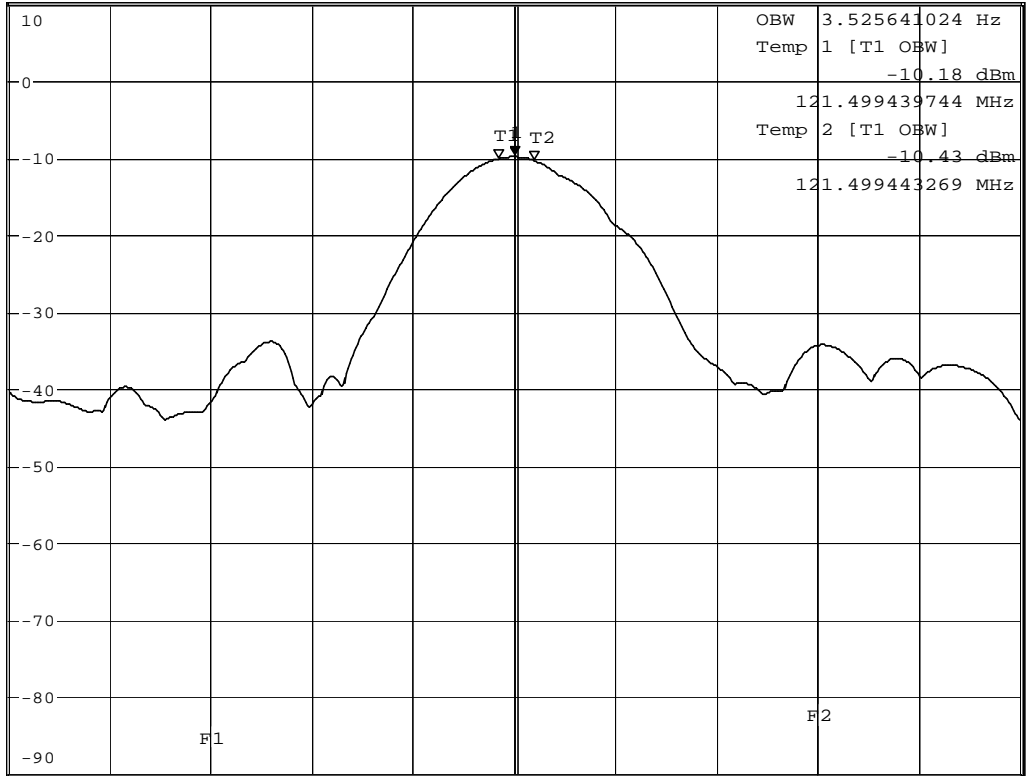


*RBW 10 Hz Marker 1 [T1]
 VBW 30 Hz -9.94 dBm
 SWT 1 s 121.499441346 MHz

Ref 10 dBm

Att 15 dB

1 PK
 VIEW



Center 121.4994413 MHz 10 Hz/ Span 100 Hz

Date: 14.SEP.2007 15:04:23

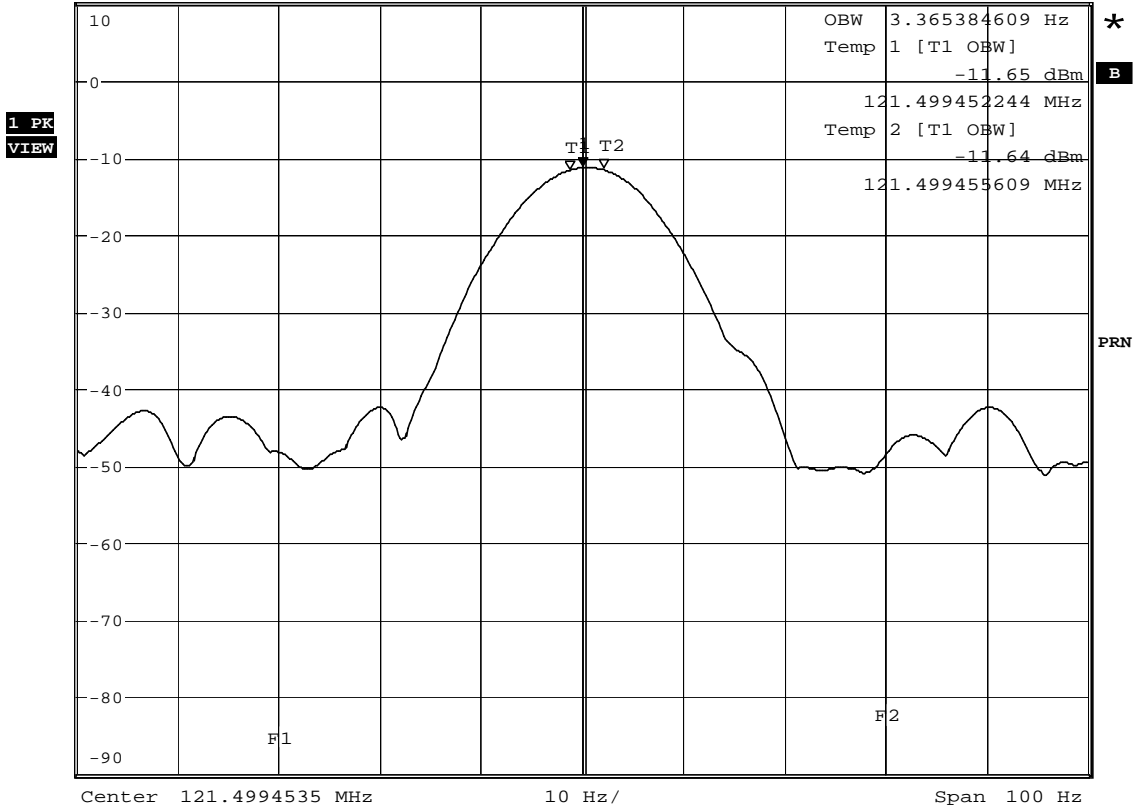
Frequency Coherence – High (+55°C)



Product Service



Ref 10 dBm Att 15 dB RBW 10 Hz Marker 1 [T1]
VBW 30 Hz -11.32 dBm
SWT 1 s 121.499453526 MHz



Date: 12.SEP.2007 10:00:18

Frequency Coherence – Low (-20°C)



Product Service



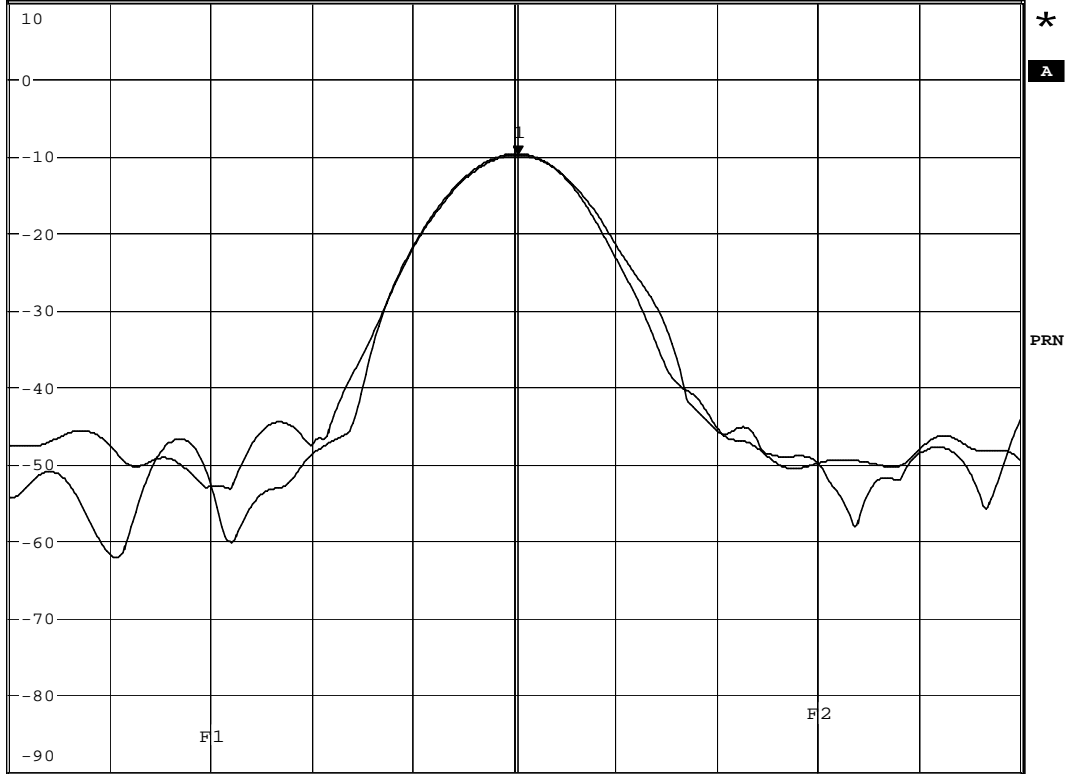
*RBW 10 Hz Marker 1 [T1]
VBW 30 Hz -9.98 dBm
SWT 1 s 121.499441346 MHz

Ref 10 dBm

Att 35 dB

1 PK
VIEW

2 AP
VIEW



Center 121.499441 MHz 10 Hz/ Span 100 Hz

Date: 14.SEP.2007 18:18:47

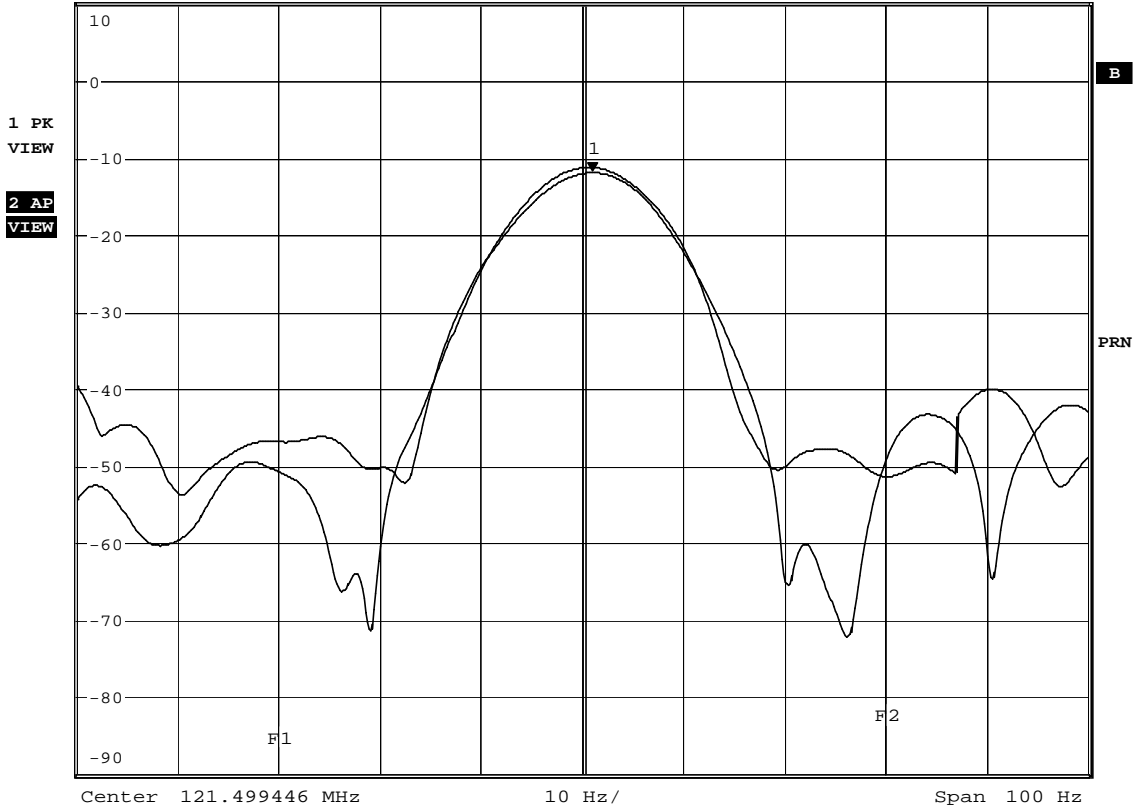
Frequency Drift – High (+55°C)



Product Service



Ref 10 dBm Att 35 dB RBW 10 Hz Marker 1 [T1]
VBW 30 Hz -12.00 dBm
SWT 1 s 121.499446955 MHz



Date: 12.SEP.2007 10:08:00

Frequency Drift – Low (-20°C)



Product Service

2.24 PEAK EFFECTIVE RADIATED POWER

2.24.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A17.3

2.24.2 Equipment Under Test

Tron 40S MkII, Serial Number 003

2.24.3 Date of Test and Modification State

25 October 2007 - Modification State 7

2.24.4 Test Equipment Used

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

2.24.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Operating

2.24.6 Test Results

Note: EUT battery used for test had been operational in the same beacon for a duration of »44hours.

Measurements were made (in dBm) at an arbitrarily chosen azimuth angle across a range of elevation angles. Upon finding the maximum, the elevation was fixed and 12 measurements made at 30° azimuth increments.

These results (from the vertically polarised dipole) were converted to PERP in mW. See the following table.

Elevation (°)	Azimuth (°)											
	0	30	60	90	120	150	180	210	240	270	300	330
5	57.3	-	-	-	-	-	-	-	-	-	-	-
10	82.9	-	-	-	-	-	-	-	-	-	-	-
15	88.2	86.2	76.8	71.7	68.4	75.0	84.2	90.2	82.3	80.4	76.8	80.4
20	74.0	-	-	-	-	-	-	-	-	-	-	-

The median result was calculated to be 79.3mW, or 18.99dBm.

The ratio between the maximum and minimum of the highest 11 values was calculated to be 1.26 (showing the antenna to be radiating almost equally in all directions, hence, omnidirectional)



Product Service

2.25 VSWR MEASUREMENT

2.25.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A17.1

2.25.2 Test Results

Antenna is not removable, hence test is not applicable.



Product Service

2.26 HUMIDITY TEST

2.26.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A18

2.26.2 Equipment Under Test

Tron 40S MkII, Serial Number 002

2.26.3 Date of Test and Modification State

18 to 19 October 2007 - Modification State 7

2.26.4 Test Equipment Used

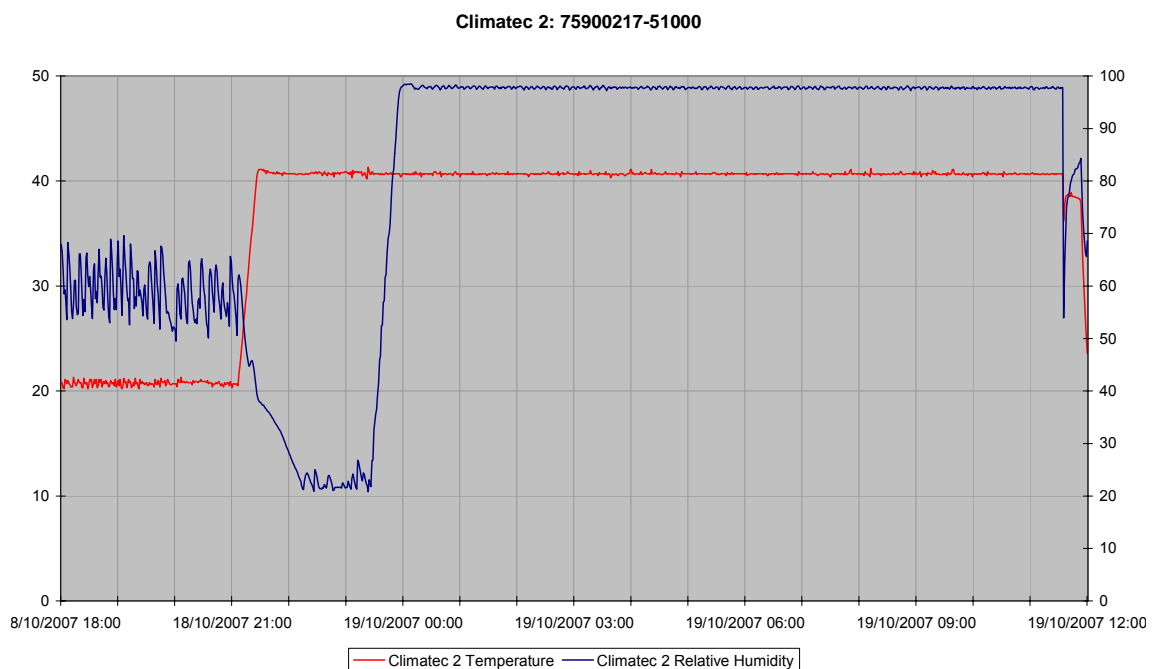
The major items of test equipment used for the above tests are identified in Section 3.1.

2.26.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle and Operating as per "Specification Reference", above.

2.26.6 Environmental Conditions

Humidity Test Conditions Plot





Product Service

2.26.7 Test Results

The EUT was subjected to an Aliveness Test before the commencement of testing, see Beacon Test Report below.

18th October 2007

The EUT was dismantled, exposing the internal electrical components to the humid test environment.

The EUT was positioned in the climatic chamber. The chamber conditions were adjusted to +40°C, 97% RH. The chamber conditions were maintained for a period of 11 hours 30 minutes.

19th October 2007

The EUT was removed from the chamber into laboratory ambient conditions. The EUT was powered on immediately after being removed from the chamber. An Aliveness Test was performed 15 minutes after the EUT was removed from the chamber, see Beacon Test Report below.



Product Service

Beacon Test Report (Pre-test)

Beacon Test Report

193DE847E0FFBFF

Organization:
Tested By:
Date: 17-Oct-07 6:33:50 PM
Tester Model/Serial No./File Name: BT100S/1025/jo epirb pre hum-1
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 24°C

PASS **FAIL** **INITIALS:** _____

Notes: Add text comments here.

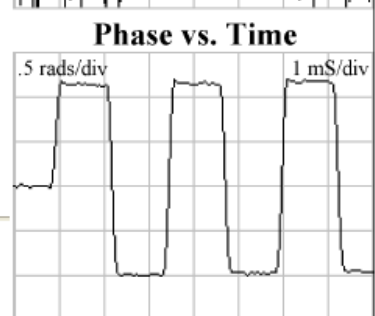
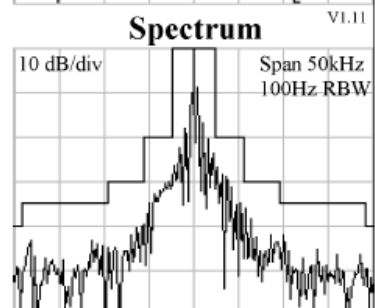
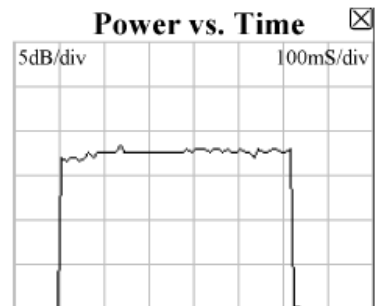
15 Hex ID: 193DE847E0FFBFF
Full Hex: FFFED08C9EF423F07FDFFA53F7F783E0F66C
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 201: Albania
Bits 41 - 64: 15999984

Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * * * * *
Longitude: * * * * *

406 MHz Measurements
406 Frequency (INT REF): 406.0371 MHz
406 Power (INT ANT): 46%
Power Rise Time: < 5 ms
Phase Deviation: -0.98 +1.15 radians
Modulation Rise Time: 142 uS
Modulation Fall Time: 117 uS
Modulation Symmetry: 0.8%
Modulation Bit Rate: 399.5 bps
CW Preamble: 159.5 ms

121.5 MHz Measurements
121 Frequency (INT REF): Detected.
121 Power (INT ANT): 15%
Signal was unmodulated.

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.



Note: The "Tester Cal Due Date" is expired; this item of test equipment is "TU": Traceability Unscheduled.



Product Service

Beacon Test Report (Post-Test)

Beacon Test Report

193DE847E0FFBFF

Organization:
Tested By:
Date: 19-Oct-07 1:08:43 PM
Tester Model/Serial No./File Name: BT100S/1025/0217-posthumid-3
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 26°C

PASS **FAIL** **INITIALS:** _____

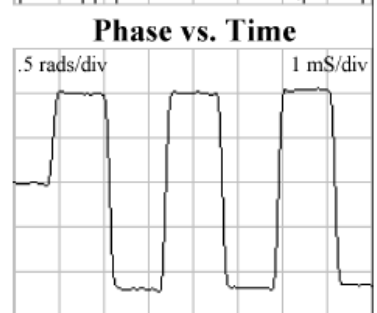
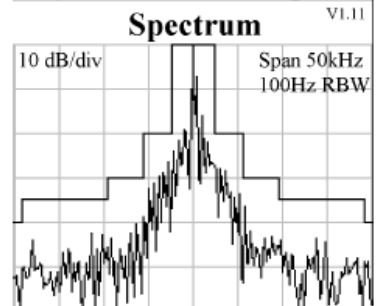
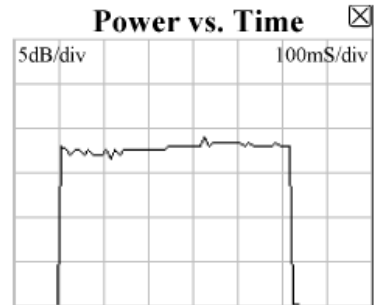
Notes: Add text comments here.

15 Hex ID: 193DE847E0FFBFF
Full Hex: FFFE2F8C9EF423F07FDFFA53F7F783E0F66C
Burst Mode: Normal Mode (Long)
Protocol: Standard Test Protocol
Country 201: Albania
Bits 41 - 64: 15999984

Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * * * * *
Longitude: * * * * *

406 MHz Measurements
406 Frequency (INT REF): 406.037 MHz
406 Power (INT ANT): 62%
Power Rise Time: < 5 ms
Phase Deviation: -1.19 +1 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0.8%
Modulation Bit Rate: 399.7 bps
CW Preamble: 160.6 ms

121.5 MHz Measurements
121 Frequency (INT REF): 121.4995 MHz
121 Power (INT ANT): 51%
Sweep Direction: Downwards
Audio Frequency: 375 Hz to 1250 Hz
Sweep Range: 875 Hz
Sweep Rep Rate: 2.6 Hz
Modulation Factor: 87 %
Duty Cycle: 40 %



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Note: The "Tester Cal Due Date" is expired; this item of test equipment is "TU": Traceability Unscheduled.



Product Service

2.27 ORIENTATION TEST**2.27.1 Specification Reference**

RTCM Paper 77-2002/SC110-STD, Clause A17.1

2.27.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.27.3 Date of Test and Modification State

25 January 2008 - Modification State 7

2.27.4 Test Equipment Used

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

2.27.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Operating

2.27.6 Environmental Conditions

Ambient Temperature	21.8°C
Relative Humidity	35%
Atmospheric Pressure	1032mbar

2.27.7 Test Procedure

The EUT was connected to two beacon testers (one to the 406MHz output for Aliveness test results and one to the 121MHz homer output for verification of auxiliary radio-locating transmitter operation via audible demodulation). The strobe light's operation was verified visually.

The following results were obtained in the appropriate orientations as per "Specification Reference", above.

2.27.8 Test Results

The strobe light and auxiliary radio-locating transmitter (121MHz homer) operated uninterrupted throughout the test.

The following aliveness test results were obtained the stated number of minutes after the EUT was placed in the appropriate orientation.



Product Service

Vertical Beacon Orientation (Initial, 15 minutes)

Beacon Test Report

A02D4001940017D

Organization:
Tested By:
Date: 25-Jan-08 1:33:09 PM
Tester Model/Serial No./File Name: BT100S/1025/00217_Orientation-19
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 29°C

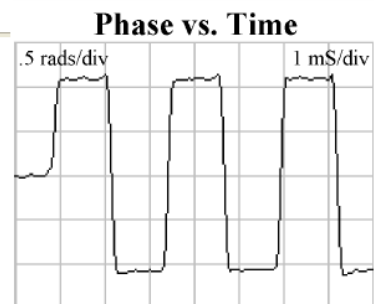
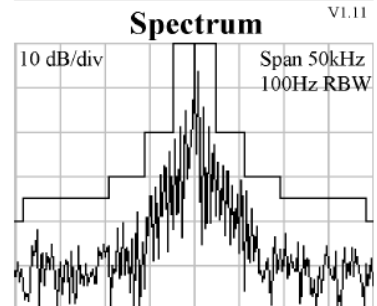
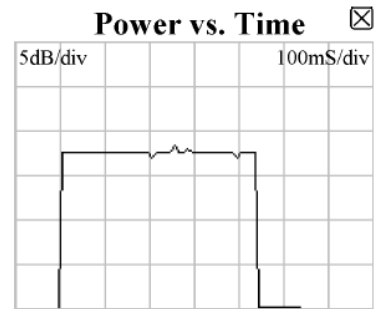
PASS **FAIL** **INITIALS:** _____

Notes: Add text comments here.

15 Hex ID: A02D4001940017D
Full Hex: FFFE2F5016A000CA000BEFC00FD0
Burst Mode: Normal Mode (Short)
Protocol: Serial EPIRB Automatic Protocol
Country 257: Norway
National use: Not Used
C/S Approval #: 95
Serial Number: 101
Auxiliary Radio: 121.5 MHz
Emergency type: Unspecified
Activation type: Auto

406 MHz Measurements
406 Frequency (INT REF): 406.0372 MHz
406 Power (INT ANT): 82%
Power Rise Time: < 5 ms
Phase Deviation: -1.07 +1.08 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 130 uS
Modulation Symmetry: 0.4%
Modulation Bit Rate: 399.7 bps
CW Preamble: 161 ms

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Note: 82% Power is equivalent to 36.9dBm – a check at the time of the test was made to verify this. Furthermore, the “Tester Cal Due Date” is expired; this item of test equipment is “TU”: Traceability Unscheduled.



Product Service

Horizontal Beacon Orientation (2 minutes)

Beacon Test Report

A02D4001940017D

Organization:

Tested By:

Date: 25-Jan-08 1:36:32 PM

Tester Model/Serial No./File Name: BT100S/1025/00217_Orientation-23

Tester Cal Due Date: Nov 10, 2006

Tester Temperature: 30°C



PASS



FAIL

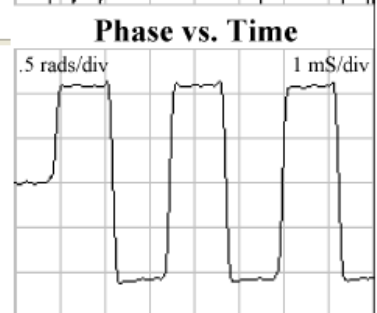
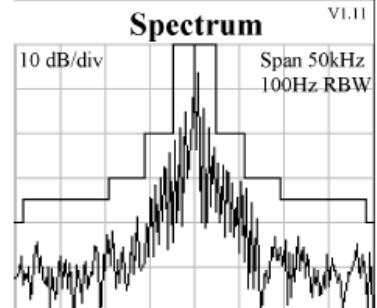
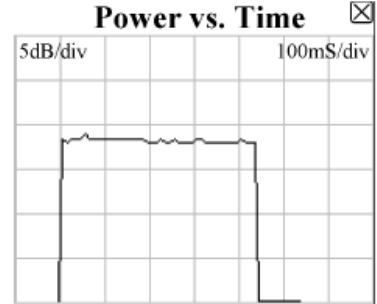
INITIALS: _____

Notes: Add text comments here.

15 Hex ID: A02D4001940017D
Full Hex: FFFE2F5016A000CA000BEFC00FD0
Burst Mode: Normal Mode (Short)
Protocol: Serial EPIRB Automatic Protocol
Country 257: Norway
National use: Not Used
C/S Approval #: 95
Serial Number: 101
Auxiliary Radio: 121.5 MHz
Emergency type: Unspecified
Activation type: Auto

406 MHz Measurements
406 Frequency (INT REF): 406.0372 MHz
406 Power (INT ANT): 82%
Power Rise Time: < 5 ms
Phase Deviation: -1.08 +1.08 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 117 uS
Modulation Symmetry: 0.3%
Modulation Bit Rate: 399.7 bps
CW Preamble: 160.6 ms

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.



Note: 82% Power is equivalent to 36.9dBm – a check at the time of the test was made to verify this. Furthermore, the “Tester Cal Due Date” is expired; this item of test equipment is “TU”: Traceability Unscheduled.



Product Service

Inverted Beacon Orientation (2 minutes)

Beacon Test Report

A02D4001940017D

Organization:

Tested By:

Date: 25-Jan-08 1:39:02 PM

Tester Model/Serial No./File Name: BT100S/1025/00217_Orientation-26

Tester Cal Due Date: Nov 10, 2006

Tester Temperature: 30°C



PASS



FAIL

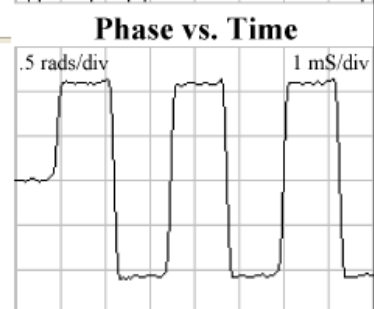
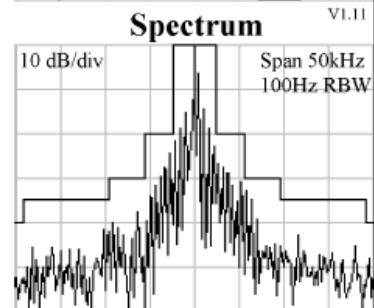
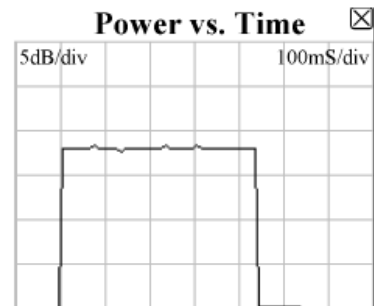
INITIALS: _____

Notes: Add text comments here.

15 Hex ID: A02D4001940017D
Full Hex: FFFE2F5016A000CA000BEFC00FD0
Burst Mode: Normal Mode (Short)
Protocol: Serial EPIRB Automatic Protocol
Country 257: Norway
National use: Not Used
C/S Approval #: 95
Serial Number: 101
Auxiliary Radio: 121.5 MHz
Emergency type: Unspecified
Activation type: Auto

406 MHz Measurements
406 Frequency (INT REF): 406.0372 MHz
406 Power (INT ANT): 82%
Power Rise Time: < 5 ms
Phase Deviation: -1.07 +1.08 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 117 uS
Modulation Symmetry: 0.4%
Modulation Bit Rate: 399.7 bps
CW Preamble: 161 ms

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.



Note: 82% Power is equivalent to 36.9dBm – a check at the time of the test was made to verify this. Furthermore, the “Tester Cal Due Date” is expired; this item of test equipment is “TU”: Traceability Unscheduled.



Product Service

Vertical Beacon Orientation (Final, 2 minutes)

Beacon Test Report

A02D4001940017D

Organization:
Tested By:
Date: 25-Jan-08 1:41:33 PM
Tester Model/Serial No./File Name: BT100S/1025/00217_Orientation-29
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 30°C

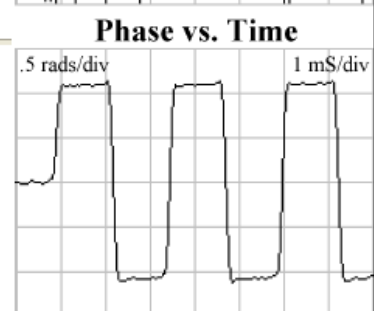
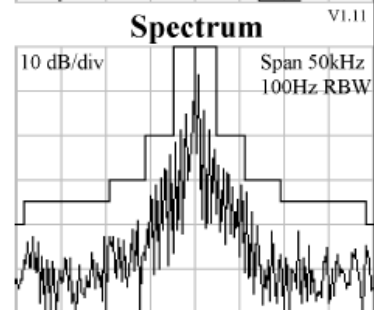
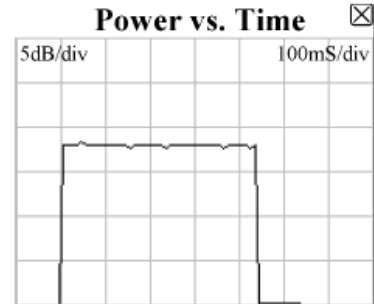
PASS **FAIL** **INITIALS:** _____

Notes: Add text comments here.

15 Hex ID: A02D4001940017D
Full Hex: FFFE2F5016A000CA000BEFC00FD0
Burst Mode: Normal Mode (Short)
Protocol: Serial EPIRB Automatic Protocol
Country 257: Norway
National use: Not Used
C/S Approval #: 95
Serial Number: 101
Auxiliary Radio: 121.5 MHz
Emergency type: Unspecified
Activation type: Auto

406 MHz Measurements
406 Frequency (INT REF): 406.0372 MHz
406 Power (INT ANT): 83%
Power Rise Time: < 5 ms
Phase Deviation: -1.07 +1.09 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 130 uS
Modulation Symmetry: 0%
Modulation Bit Rate: 399.7 bps
CW Preamble: 160.8 ms

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.



Note: 83% Power is equivalent to 37.0dBm – a check at the time of the test was made to verify this. Furthermore, the “Tester Cal Due Date” is expired; this item of test equipment is “TU”: Traceability Unscheduled.



Product Service

SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

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

Instrument	Manufacturer	Type No	TE Number	Calibration Due
Section 2.23 Beacons - 121 Frequency Coherence				
Climatic Chamber	Heraeus Votsch	VM 04/100	85	O/P Mon
Attenuator 10dB 25W	Weinschel	46-10-43	400	13-Apr-2008
Attenuator (10dB)	Weinschel	47-10-34	481	26-Feb-2008
Filter, Broadband	Texscan	8BC-134-67-3-BB	1241	TU
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	24-Jul-2008
Hygrometer	Rotronic	I-1000	3068	25-Apr-2008
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3159	30-May-2008
Thermocouple Thermometer	Fluke	51	3172	18-Jun-2008
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3351	18-Apr-2008
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	3357	18-Apr-2008
Section 2.4 Vibration – Sine and Bump				
Charge Amplifier	Endevco	133	2506	28-Sep-2007
Vibration Controller	Hewlett Packard	E1434A	2507	2-Mar-2007
Vibration System	Ling Dynamic Systems	LAS V964	2515	1-May-2007
Charge Amplifier	Endevco	133	2725	6-Jul-2007
Isotron Accelerometer	Endevco	256-10	3111	23-Feb-2007
Isotron Accelerometer	Endevco	256-10	3113	22-Feb-2007
Isotron Accelerometer	Endevco	256-10	3114	22-Feb-2007
Isotron Accelerometer	Endevco	256-10	3119	27-Feb-2007



Instrument	Manufacturer	Type No	TE Number	Calibration Due
Sections 2.19, 2.20 & 2.21 Beacons – 121 Modulation and Frequency Characteristics				
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
Beacon 50Ω Unit	TUV	50Ω	97	TU
Attenuator 10Db 25W	Weinschel	46-10-43	400	13-Apr-2008
Attenuator (10Db, 10W)	Weinschel	23-10-34	470	19-Jun-2008
Attenuator (10Db)	Weinschel	47-10-34	481	26-Feb-2008
Load (50Ω, 15W)	Diamond Antenna	DL-30N	822	5-Sep-2008
Climatic Chamber	Unitemp	MINISTRAT	2129	18-Sep-2007
Distress Beacon 50Ω Unit	TUV	-	2445	TU
Beacon 50Ω Unit	TUV	50Ω	3066	TU
Hygrometer	Rotronic	I-1000	3068	25-Apr-2008
Termination (50Ω, 6W)	Micronde	R404613	3074	24-Feb-2008
Termination (50Ω, 1W)	Suhner	-	3080	24-Feb-2008
Termination (50Ω, 2W)	Omni-Spectra	3001-6100	3081	24-Feb-2008
Termination (50Ω, 15W)	Diamond Antenna	DL-30N	3096	16-Mar-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
Thermocouple Thermometer	Fluke	51	3172	18-Jun-2008
Time Interval Analyser	Yokogawa	TA720 704510	3253	4-Oct-2007
Scope Corder	Yokogawa	DL750 701210	3254	9-Oct-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	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	3358	18-Apr-2008
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3359	18-Apr-2008



Instrument	Manufacturer	Type No	TE Number	Calibration Due
Sections 2.19, 2.20 & 2.21 Beacons – 121 Modulation and Frequency Characteristics (Continued)				
Cable (3m, N-type)	Rhophase	NPS-1601-3000-NPS	3360	18-Apr-2008
Cable (3m, N-type)	Rhophase	NPS-1601-3000-NPS	3361	18-Apr-2008
Section 2.22 Beacons - 121 Modulation Factor				
Attenuator 10dB 25W	Weinschel	46-10-43	400	13-Apr-2008
Attenuator (10dB)	Weinschel	47-10-34	481	26-Feb-2008
Sensor Module	Hewlett Packard	11722A	1333	21-Nov-2007
Climatic Chamber	Unitemp	MINISTRAT	2129	18-Sep-2007
Oscilloscope	Lecroy	9370	2832	21-Sep-2007
Hygrometer	Rotronic	I-1000	3068	25-Apr-2008
Modulation Analyser	Hewlett Packard	8901B	3292	20-Nov-2007
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3351	18-Apr-2008
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3353	18-Apr-2008
Section 2.24 Beacons - Antenna Characteristics (“Peak Effective Radiated Power”)				
Antenna, (Tuned Dipole Set)	Roberts Antenna	A-100	569	TU
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
Antenna Tower 6M	EMCO	1050	1859	TU
Roberts Antenna 406MHz	Compliance Design	-	1860	29-Jun-2009
Roberts Antenna 406MHz	Compliance Design	-	1861	12-Sep-2007
Test Receiver	Rohde & Schwarz	ESIB40	2941	19-Oct-2008



Instrument	Manufacturer	Type No	TE Number	Calibration Due
Section 2.10 Beacons - 121 Spurious Emissions				
Rubidium Frequency Standard	Quartzlock	A10-B	92	22-Dec-2007
Climatic Chamber	Unitemp	MINISTRAT	2129	18-Sep-2007
Hygrometer	Rotronic	I-1000	3068	25-Apr-2008
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3159	30-May-2008
ESA-E Series Spectrum Analyser	Agilent	E4402B	3348	16-Apr-2008
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3356	18-Apr-2008
Climatic Chamber	Heraeus Votsch	VM 04/100	85	O/P Mon
Load (50Ω, 15W)	Diamond Antenna	DL-30N	822	5-Sep-2008
Spectrum Analyser	Hewlett Packard	E4407B	1154	31-May-2007
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3158	30-May-2008
Attenuator (3dB, 20W)	Aeroflex / Weinschel	23-3-34	3163	1-Jun-2007
Thermocouple Thermometer	Fluke	51	3172	18-Jun-2008
Bandpass Filter	Trilithic	5BE406/35-1-AA	3207	O/P Mon
Cable (1m, N type)	Rhophase	NPS-1601-1000-NPS	3350	18-Apr-2008
Cable (1m, N type)	Reynolds	269-0088-1000 0201	3079	2-Aug-2007
Section 2.3, Damp Heat Test				
Climatic Chamber	Climatec	CLIMATEC 3	2846	18-Apr-2007
Section 2.1 Beacons – Initial Aliveness Test				
Beacon Tester	WS Technologies	BT 100S	87	TU
Section 2.27 Beacons – Orientation Test				
Beacon Tester	WS Technologies	BT 100S	87	TU
Stop Clock	R.S Components	RS328 061	2674	TU
Hygrometer	Rotronic	I-1000	3068	25-Apr-2008
EPIRB Tester	Arg Electro Design	5412	3270	TU



Instrument	Manufacturer	Type No	TE Number	Calibration Due
Section 2.13 Beacons – Operating Lifetime				
Climatic Chamber	Heraeus Votsch	VMT 04/30	40	O/P Mon
Signal Generator	Rohde & Schwarz	SMX	43	10-May-2008
Power Meter	Hewlett Packard	436A	47	9-Jul-2008
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
Time Interval Analyser	Yokogawa	TA720	181	21-Feb-2008
Termination	Diamond Antenna	DL-30N	187	28-Nov-2007
Signal Generator	Hewlett Packard	8644A	199	11-Jan-2008
Attenuator 10dB 25W	Weinschel	46-10-43	400	13-Apr-2008
Attenuator: 10dB/20W	Narda	766-10	480	13-Jul-2007
Power Meter	Hewlett Packard	436A	751	12-Sep-2007
Spectrum Analyser	Hewlett Packard	E4407B	1154	19-Jul-2008
Signal Generator	Hewlett Packard	3336C	1185	17-Jul-2007
Signal Generator	Hewlett Packard	3336C	1189	19-Jul-2008
Filter, Broadband	Texscan	8BC-134-67-3-BB	1241	TU
Power Sensor	Hewlett Packard	8482A	1341	4-Oct-2007
Distress Beacon 50Ω Unit	TUV	-	2445	TU
Multimeter	Hewlett Packard	3478A	2758	21-Jul-2007
Beacon 50Ω Unit	TUV	50Ω	3066	TU
Hygrometer	Rotronic	I-1000	3068	25-Apr-2008
Termination (50Ω, 6W)	Micronde	R404613	3074	24-Feb-2008
Termination (50Ω, 1W)	Suhner	-	3080	24-Feb-2008
Termination (50Ω, 2W)	Omni-Spectra	3001-6100	3081	24-Feb-2008



Instrument	Manufacturer	Type No	TE Number	Calibration Due
Section 2.13 Beacons - Operating Lifetime – Continued				
Termination (Pico, 15W)	Diamond Antenna	DL-30N	3097	16-Mar-2008
Termination (Pico, 15W)	Diamond Antenna	DL-30N	3098	16-Mar-2008
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3158	1-Jun-2007
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3159	30-May-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
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	3205	28-Jul-2008
Bandpass Filter	Trilithic	5BE406/35-1-AA	3207	O/P Mon
Time Interval Analyser	Yokogawa	TA720 704510	3253	6-Nov-2008
Scope Corder	Yokogawa	DL750 701210	3254	6-Nov-2008
8 Channel Datalogger + Terminal Board	Pico Technology Ltd	ADC-16	3287	13-Nov-2007
Power Sensor	Agilent	8482A	3290	14-Nov-2007
Resistor (Nominal 0.25ohm)	TUV	2x RS Components 188-071, R5/100W Resistors	3343	TU
ESA-E Series Spectrum Analyser	Agilent	E4402B	3348	16-Apr-2008
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3351	18-Apr-2008
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	3356	18-Apr-2008
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3358	18-Apr-2008
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3359	18-Apr-2008
Cable (3m, N-type)	Rhophase	NPS-1601-3000-NPS	3360	18-Apr-2008
Cable (3m, N-type)	Rhophase	NPS-1601-3000-NPS	3361	18-Apr-2008



Instrument	Manufacturer	Type No	TE Number	Calibration Due
Section 2.15 Beacons - Self Test				
Climatic Chamber	Heraeus Votsch	VMT 04/30	40	O/P Mon
Beacon Tester	WS Technologies	BT 100S	87	TU
Rubidium Frequency Standard	Quartzlock	A10-B	92	22-Dec-2007
Signal Generator	Hewlett Packard	8644A	96	11-Jan-2008
Climatic Chamber	Unitemp	MINISTRAT	2129	18-Sep-2007
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, 75W)	Bird	8308-200	3076	26-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
Attenuator (3dB, 20W)	Aeroflex / Weinschel	23-3-34	3163	30-May-2008
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	O/P Mon
Time Interval Analyser	Yokogawa	TA720 704510	3253	4-Oct-2007
Scope Corder	Yokogawa	DL750 701210	3254	9-Oct-2007
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	3359	18-Apr-2008
Sections 2.7 and 2.8 ENV - Free Fall Drop ("Drop Test")				
Climatic Chamber	Unitemp	MINISTRAT	2129	18-Sep-2007
Tape Measure	Stanley	-	2276	TU
Hardwood Block	Unknown	ELM	2650	TU



Product Service

Instrument	Manufacturer	Type No	TE Number	Calibration Due
Section 2.2 Climatic – High Temperature (“Dry Heat”)				
Temperature Chamber	Instron	906	2128	7-Dec-2007
Section 2.6 Climatic - Salt				
WEISS TECHNIK (T)	Weiss Technik	SALT MIST	2121	OP MON
Balance	Geniweigher	GM-11K	2334	15/03/2007 (Used at the beginning of the test when still calibrated)
PM METER	Unknown		2335	TU
Thermometer	Digitron	2098T	2347	27/09/2007
Balance	Sartorius	HK160	2678	15/03/2007 (Used at the beginning of the test when still calibrated)
Measuring cylinder	Unknown	50mL	3136	TU
Section 2.20, Stability And Buoyancy				
Beacon Tester	WS Technologies	BT 100S	87	TU
Digital Force Gauge (500N)	TWL	AFG4	2971	16-Nov-2007
ESA-E Series Spectrum Analyser	Agilent	E4402B	3348	16-Apr-2008



Product Service

Instrument	Manufacturer	Type No	TE Number	Calibration Due
Section 2.26 Humidity				
Beacon Tester	WS Technologies	BT 100S	87	TU
Climatic Chamber	Climatec	CLIMATEC 3	2846	18-Apr-2008
Sections 2.9, 2.11 & 2.12 Climatic - Wet Tests ("Leakage And Immersion" and "Thermal Shock")				
Beacon Tester	WS Technologies	BT 100S	87	TU
Over Pressure (T)	ASL (TUV)	0 TO 15 PSI	2125	Class 1 (Int)
Balance	Geniweigher	GM-11K	2334	30-Mar-2008
Thermometer	Digitron	T208	2340	20-Jun-2008
Digital Pressure Indicator	Druck	DPI 700	2351	18-Jun-2008
Tape Measure	Stanley		2363	TU
Stopwatch	Farnell	SUPER LAB/SPLIT	2465	15-Jun-2008
Climatic Chamber	Climatec	CLIMATEC 3	2846	18-Apr-2008
Digital Force Gauge (500N)	TWL	AFG4	2971	16-Nov-2007
ESA-E Series Spectrum Analyser	Agilent	E4402B	3348	16-Apr-2008
Thermocouple	Unknown	Type T	3415	8-Feb-2009

TU – Traceability Unscheduled

OP MON – Output Monitored with Calibrated Equipment



Product Service

SECTION 4

PHOTOGRAPHS



4.1 PHOTOGRAPHS OF EQUIPMENT UNDER TEST (EUT)



Equipment Under Test, Sample Serial Number 003



View of EUT (Serial Number 003) in release mechanism



Product Service

SECTION 5

DISCLAIMERS AND COPYRIGHT



Product Service

5.1 DISCLAIMERS AND COPYRIGHT

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

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TÜV Product Service Limited

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Product Service

ANNEX A

CUSTOMER SUPPLIED INFORMATION



Product Service

Similarity of Variants

Jotron AS
Jotron Phontech AS
Jotron UK Ltd.
Jotron Asia Pte. Ltd.
Jotron USA, Inc.
UAB Jotron



TUV Product Service Ltd
Octagon House, Concorde Way, Segensworth
North, Fareham, Hampshire
PO15 5RL
United Kingdom

Tjodalyng: 07.01.2008

Tron 40S MkII and Tron 40GPS MkII

The Tron 40S MkII and Tron 40GPS MkII use the same housing, battery pack, boards, software, brackets and technical manual.

The difference between the Tron 40S MkII and the Tron 40GPS MkII is the GPS module, the GPS patch antenna and the Users manual.

The GPS module and the GPS patch antenna are mounted on each side of the Main Board for the Tron 40GPS MkII.

Eirik Storjordet
Certification Manager

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Fax: +47 33 12 67 80



Hardware Modification Information

	Selftest	Number
	40S MkII	Page 1(1)

Problem:

The beacon failed with error message "low power 121.5" in selftest at -20°C. Det beacon had no error message at selftest in 20°C.

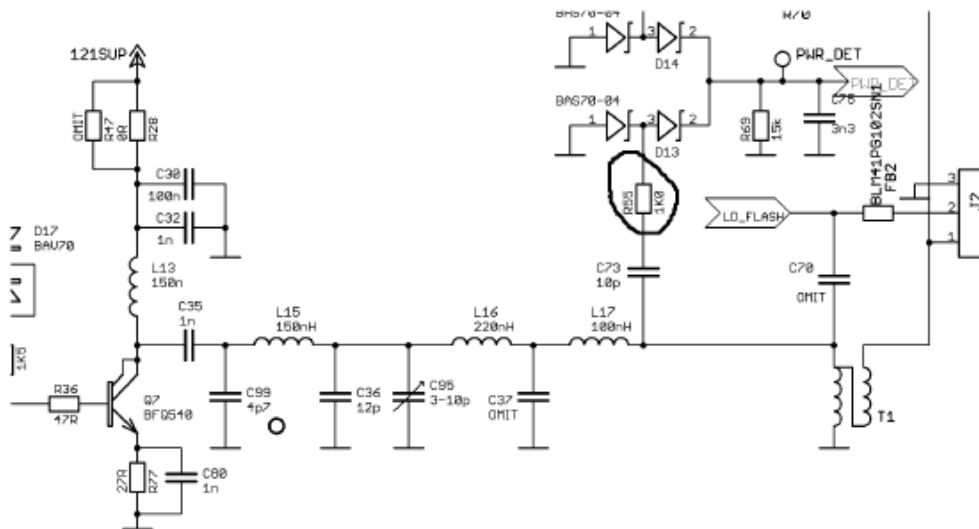
Reason:

The 121.5 MHz signal is rectified through a resistor R55. The rectified signal was too low/ or on edge, to be detected as a "OK" in selftest.

Change:

At the visit at TUV 11. Sept 07, this resistor R55 was changed from 1K5 to 1K0 to increase the rectified signal. This change does not affect other parameters in the beacon.

Figure 1 – Shows the 121.5 outputstage with the rectifier for the power detect:



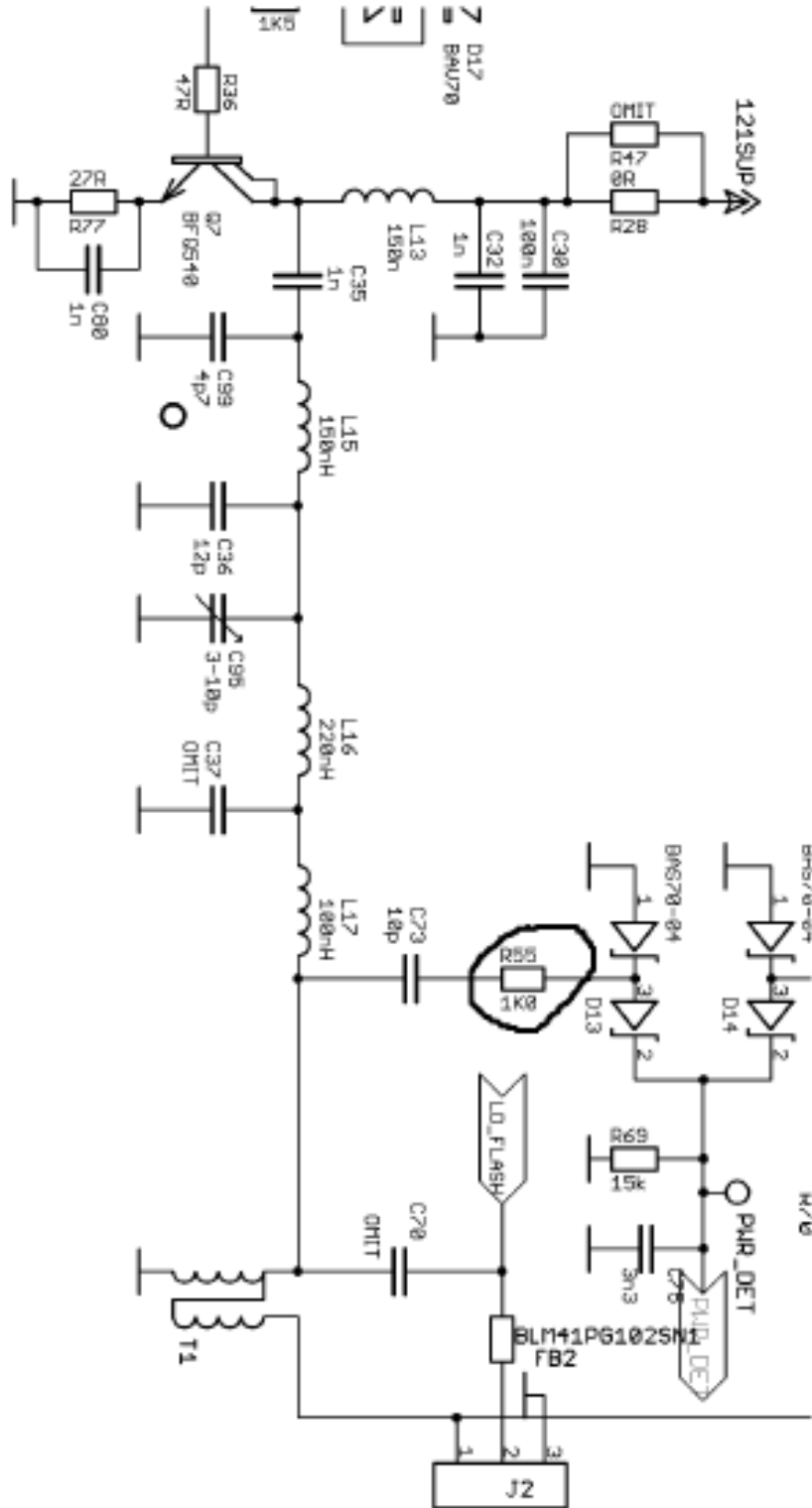
Author: Arne Fredriksen

3707

13. Sept 07



Modification Information (Detail of Schematic, Above)





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1. STROBE LIGHT TESTS

1.1 Test specifications and sequence

The effective luminous intensity shall be at least an arithmetic mean of 0.5 cd over the entire upper hemisphere as determined below. The flash rate shall be 20 to 30 times per minute. The flash duration shall be between 10^{-6} s and 10^{-1} s.

The effective luminous intensity shall be measured at 49 points over the upper hemisphere of the satellite EPIRB. The satellite EPIRB shall be floated in a container of fresh water to determine its waterline, which shall then be marked on the body of the satellite EPIRB and used as the baseline for the following tests. The effective luminous intensity shall be measured in accordance with the following table. The arithmetic mean effective luminous intensity of all 49 points shall be at least 0,50 cd. No points shall have an effective luminous intensity of less than 0.2cd.

1.2 Test program

The effective luminous intensity, flash duration and flash rate shall be checked at the normal temperature and at the extreme temperatures. The effective luminous intensity shall be defined by the following formula as indicated in IMO Resolution MSC.81(70) – Testing of life-saving appliances, 10.4.9:

$$\frac{\int_{t_1}^{t_2} i \cdot dt}{0,2 + (t_2 - t_1)}$$

For 50msec pulse (t2-t1)=0,05

where

i is the instantaneous intensity;

0,2 is the Blondel-Rey constant;

$t_2 - t_1$ are the time limits of integration in seconds at which the intensity is i or greater.

$$\frac{\int_{t_1}^{t_2} i \cdot dt}{0,25} = 4 \int_{t_1}^{t_2} i \cdot dt$$

1.3 Equipment under test

Name : Tron 40GPS MkII

Ser. Nr: 001

1.4 Test site

Jotron AS, New lab.



Product Service

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1.5 Test Equipment

IL 1700 Light measuring equipment with calibration certificates.
SED033 sensor with type Y filter and type L30 lens.

1.6 Description of light test

The test site was covered inside with black textiles and the light measure equipment was mounted. The calibration factor for lux measurement was installed in the IL 1700.

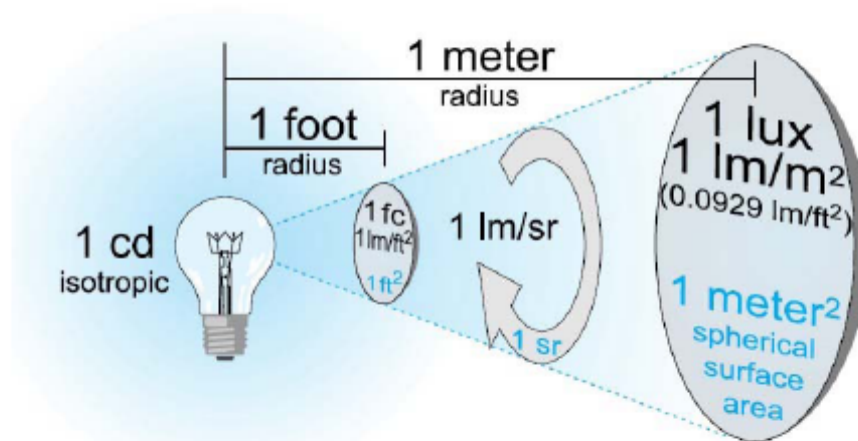


Figure 1.6 The relation between the units

From this relation we can conclude that if we use a distance of 1 meter between the sensor and the light source, 1 lux is equivalent to 1 candela. The pulse width is 50ms.

1.6.1 Conclusion

The light source of the EUT is to be placed 1 meter from the sensor. The IL 1700 is set to zero point the background lightning and to measure integrated light. The integrated light can then be measured during 4 pulses, and the final value will be directly in candela.

The Tron 40S MkII and Tron 40GPS MkII are 100% identical related to this test, so the test results are valid for both units.

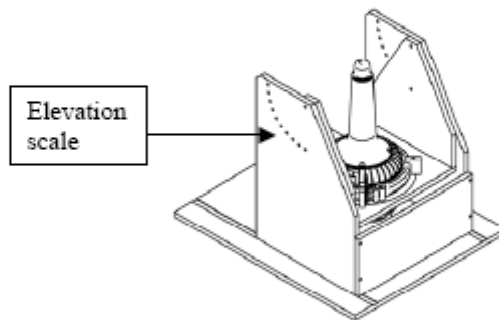
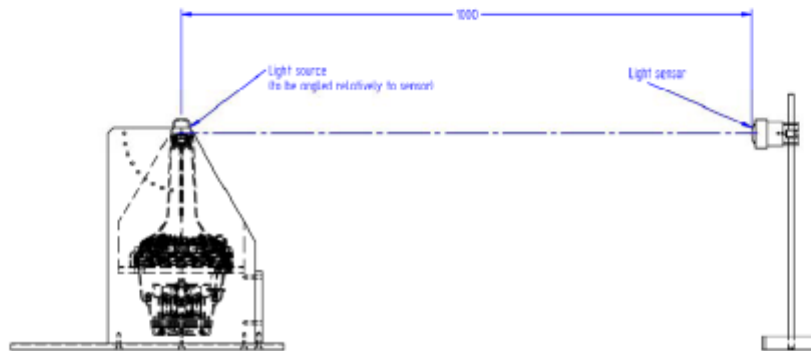


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1.7 Test Jig drawings

The EPIRB can be set to the right elevation and rotated to the right azimuth.





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1.8 Test Jig pictures

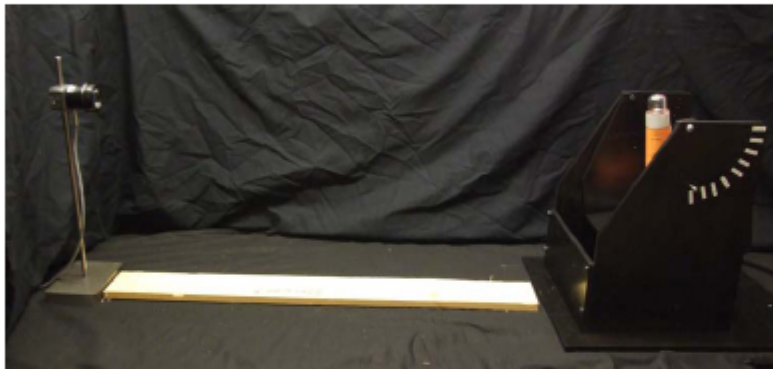


Figure 1.8a Showing test jig and light sensor with lens and a measure stick



Figure 1.8b Front of IL 1700

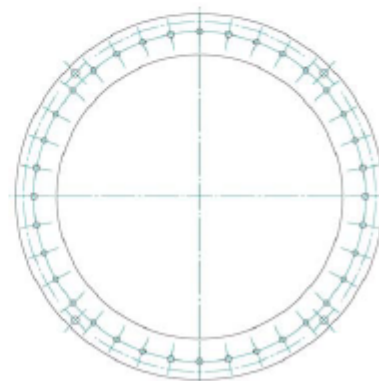


Figure 1.8c Azimuth scale



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1.9 Calibration certificate

Kalibreringsbevis
Certificate of calibration



Oppdragsgiver Client Jotron AS KIRKESTIEN 1 3280 TJODALYNG		Utførende enhet/lab. Department / laboratory responsible Teknologisk Institutt as Postboks 1019 3601 KONGSBERG		
Bevisnr. Certificate no. 07-047546	Kalibreringsdato Date of calibration 21.11.07	Utskriftsdato Date of print 22.11.2007	Sider/antall sider Page no./No. of pages 1 av 2	
Kalibrert utstyr Calibrated equipment • TIs objektID TIs obj. ID 423565 • Kundens ID Clients ID JE-41.5 • Serienr. Serial no. 4651 • Objekt Object Radiometer • Fabrikket Manufacturer InternationalLight • Modell Model IL1700		Kalibrert av Calibrated by Arne Figenschou <i>Arne Figenschou</i>		
Kalibreringsprosedyre Calibration procedure • Status Status • Temperatur og fuktighet Temperature and humidity • Anbefalt ny kalibrering Recommended new calibr.		LP 4007 Kal. uten justering / Cal. without adjustments 23°C±3°, <70% RH 22.11.08		
Kalibreringsnormer Calibration standards				
Objekt ID Object ID	Objekt Object	Fabrikket Manufacturer	Objekttype Object type	Neste kalib. Next calibr.
406067	Research Radiometer	International Light	IL1700	06.2008
406069	Detector/ Filter	International Light	SED033/Y/W	06.2008
Merknader Comments Kalibrering er utført som kompareringsmåling mot identisk primær referanse og vil ikke erstatte InternationalLight kalibrering av Radiometeret.				

Instrumentet er kalibrert i henhold til dokumentert prosedyre som kan forevises på forespørsel, og mot måleenheter som er spesifisert til nasjonale eller internasjonale normer.

This instrument is calibrated according to documented procedure which will be explained upon request, and against measuring norms traceable to national or international standards.

Teknologisk Institutt as

Alneshov 2HC Pb 2008 SL, Harsbukken, NO-0131 Oslo Tlf +47 22 86 50 00 Faks +47 22 33 16 01	Kongsberg Hæringsgata Pb 1070, NO-3601 Kongsberg Tlf +47 33 24 87 00 Faks +47 33 24 87 37	Hillevågveien 19 NO-4014 Stavanger Tlf +47 51 60 02 16 Faks +47 51 60 02 18	Fysloben Apsdalen Pb 23, NO-5168 Jægersås Tlf +47 56 22 78 40 Faks +47 56 31 22 51	Tranemoen 1 Pb 44, NO-8411 Ledingen Tlf +47 99 22 79 00 Faks +47 99 91 93 94	Karlsen Industripark Pb 163, NO-3821 Raufoss Tlf +47 81 15 44 29 Faks +47 81 15 36 35	Firmaportal@teknologisk.no www.teknologisk.no Org. nr. NO 140 680
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Kalibreringsbevis

Certificate of calibration

Bevisnr. Certificate no.
07-047546
Side Page 2 av of 2.
Date Date 22.11.2007



Måleprotokoll fra kalibrering

Kalibrering av: Radiometer
 TT's objekt ID: 423565
 Fabrikat: InternationalLight
 Modell: IL1700 Research Radiometer
 Serie nr.: 4651
 Detector: SED033 #8237
 Filter: Y #28008
 Input Optic: L30 #293

Utførelse:

Kompareringsmåling mot TT's referans Radiometer
 Primer standard Radiometer benyttet ved komparering er identisk med InternationalLight IL1700

Radiometerets detektor er kalibrert mot hvittlysreferanse ved rett lysinnfall.
 Til kalibrering benyttes Tungsten Halogen glødelampe med fargetemperatur 3000K ±3%
 Referansedetektor er cosinus korrigeret for rett lysinnfall med størst spektral følsomhet
 ved 555 nm i henhold til CIE V λ Photopic Standard.

Radiometer er avlest i lux med innstillinger likt iht InternationalLight kalibreringssertifikat pr. 22-Jun-05.
 (YIS) Photopic illuminance response sensitivity factor: 1.342E-07 (A) (lux-1)
 IL1700 +5V Bias: Off

Måleresultat ved komparering:

Nominell måle verdi Illuminans lux	Avlest Radiometer lux	Målt differanse	
		lux	%
280	280	0	0
410	420	10	2
780	820	40	5
1130	1200	70	6
2000	2100	100	5
3000	3000	0	0

Status

Radiometer viser god overenstemmelse ved komparering mot tilsvarende instrumet.

Beregnet måleusikkerhet:

≤ ± 6% ved dekningsfaktor k=2

Måleusikkerhet er utvidet da Input Optic Lens L30 #293 er en High Gain Lens med ±8 grader synsfelt og referanse detektor det kompareres mot er av type Wide Eye Diffuser med relativ spasiel rominnsyn respons på ±30 grader.

Spørbarhet:

NIST, U.S. National Institute of Standards and Technology



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1.10 Light test

The flash rate of the light to be controlled.

1.10.1 Flash rate

The flash rate was: 21

1.10.2 Test results

Test No.1: Effective luminous intensity at minus 20 degrees

Azimuth (in Degrees)	Elevation (in Degrees)								
	10	20	30	40	50	60	70	80	90
0	2,7	2,3	1,6	1,5	1,6	0,8	0,9	2,4	1,5

Table 1.10a Effective luminous intensity at minus 20 degrees

Test No.2: Effective luminous intensity at normal temperature

Azimuth (in Degrees)	Elevation (in Degrees)								
	10	20	30	40	50	60	70	80	90
0	3,4	2,4	1,6	1,4	1,5	0,8	0,8	2,3	1,5
45	3,8	2,5	1,6	1,5					
90	3,4	2,4	1,7	1,6	1,5	0,8	0,9	2,8	
135	3,8	2,6	1,4	1,4					
180	3,4	2,4	1,6	1,4	1,3	0,6	0,9	2,4	
225	3,8	2,6	1,7	1,4					
270	3,5	2,3	1,7	1,5	1,5	0,8	0,8	2,1	
315	3,6	2,5	1,6	1,4					

Table 1.10b Effective luminous intensity at normal temperature

Test No.3: Effective luminous intensity at plus 55 degrees

Azimuth (in Degrees)	Elevation (in Degrees)								
	10	20	30	40	50	60	70	80	90
180	2,6	1,8	1,1	1,1	1,0	0,4	0,6	1,4	1,2

Table 1.10c Effective luminous intensity at plus 55 degrees



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1.11 Test summary

Test No.	Test	IEC 61097-2 Ed.3 CDV	Result (Pass/Fail)	Date	Witness	Notified Body Number
1	At minus 20 degrees	5.3.3.3*	P	30.11.07	<i>[Signature]</i>	0470
2	At normal temperature	5.3.3.3	P	30.11.07	<i>[Signature]</i>	0470
3	At plus 55 degrees	5.3.3.3*	P	30.11.07	<i>[Signature]</i>	0470

* Limited measurements agreed with Mrs. Doreen Thoma, BSH, 29.11.2007

Authorized By:

Bjørn Rishovd
QA Manager
Jotron AS

Supervised by:

Ole A. Lynum
Technical Examination Officer
Nemko AS



Product Service

Information On Previous Testing (Automatic Release Mechanism And Automatic Activation Tests)

DET NORSKE VERITAS

Report No: 2003-3162, rev. 01

TECHNICAL REPORT



7 TESTS

Wherever several test specifications cover the same issue, the most severe requirement was used as basis for the testing.

7.1 Functional tests

7.1.1 Release mechanism

Test specifications: ETSI EN 300 066, 12

Test characteristics:

Parameters	Severity levels
Release depth	Before 4,0m
Orientations	Normal mounting pos. Rolling 90° both sides Pitching 90° both sides Upside-down

The EUT was mounted on a rod and slowly submerged into water¹, until the release mechanism was activated. The depth at time of activation was observed.

Result: In one of the orientations, the EPIRB floated up successfully, but did not release itself from the outer shell of the EUT even after reaching the surface. The EUT was therefore slightly modified (see Ch. 5.2). Repeated tests after the modification were successful. The EPIRB released itself well before 4 meter and the EUT passed the test.



Product Service

DET NORSKE VERITAS



Report No: 2003-3162, rev. 01

TECHNICAL REPORT



5 EQUIPMENT UNDER TEST

5.1 Equipment submitted for tests

Overall designation of product:

Description	Make	Type	S/N	Remarks
EPIR float free release bracket	Jotron	FB-5	NA	Prototype

The above will be referred from now as **EUT** (Equipment Under Test).

5.2 Modifications during testing

In order to pass the various tests, the EUT was modified as follows:

Test	Modifications
Release Mechanism	An extra weight was added to the outer shell to make the weight asymmetrical.
Vibration/Bump	A new design of the FB-5 bracket is being produced in the nearest future. To upgrade the unit used for testing to the right shape, tape was used on the inner side of the capsule.
Hose stream	Fixing of the label tag was moved from the release pin to a separate screw.



Product Service

Information On Previous Testing (Stability And Buoyancy Test)

Jotron AS
Jotron Phontech AS
Jotron UK Ltd.
Jotron Asia Pte. Ltd.
Jotron USA, Inc.
UAB Jotron



To whom it may concern.

Tjedalyng: 22.01.2008

STATEMENT OF ANTENNA HEIGHT OVER THE FLOAT LINE

for

Tron 40GPS MkII and Tron 40S MkII

We declare that the 406MHz antenna start height is 40mm above the float line.

A handwritten signature in blue ink, appearing to read 'Eirik Storjordet'.

Eirik Storjordet
Certification Manager

DNB Nor Bank ASA | 0021 Oslo | Norway | Bank account: 24400508514 | IBAN: NO6624400508514 | BIC: DNBANOKK | Reg.no.: NO917713324 MVA
QA Certificate: NS-EN ISO 9001:2000

Jotron AS
P.O. Box 54 | NO-3280 Tjedalyng | Norway

Tel: +47 33 13 97 00
Fax: +47 33 12 67 80

www.jotron.com



Product Service

Information On Previous Testing (Inadvertent Activation Test)

DET NORSKE VERITAS

Report No: 2003-3162, rev. 01

TECHNICAL REPORT



7.2.3 Hose stream

Test specifications: IEC 60945, 8.8
ETSI EN 300 066, 6.9

Test characteristics:

Parameters	Severity levels
Flow	2300 l/min
Hose inner diameter	63,5 mm
Distance between end of hose and EUT	3,5 m (1,5 m above EUT)
Directions of flow	All directions in an arc of 180° perpendicular to normal mounting position
Period of testing	5 min

The EUT was fixed to a wooden plat during testing.

Result: With the modification described in Ch. 5.2, EUT passed the test



Product Service

DET NORSKE VERITAS



Report No: 2003-3162, rev. 01

TECHNICAL REPORT



5 EQUIPMENT UNDER TEST

5.1 Equipment submitted for tests

Overall designation of product:

Description	Make	Type	S/N	Remarks
EPIR float free release bracket	Jotron	FB-5	NA	Prototype

The above will be referred from now as **EUT** (Equipment Under Test).

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In order to pass the various tests, the EUT was modified as follows:

Test	Modifications
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Vibration/Bump	A new design of the FB-5 bracket is being produced in the nearest future. To upgrade the unit used for testing to the right shape, tape was used on the inner side of the capsule.
Hose stream	Fixing of the label tag was moved from the release pin to a separate screw.