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December 5, 2012

Dale Williams
Tideland Signal Corporation
4310 Directors Row
Houston, Texas 77092

Dear Dale:

Thank you for the opportunity to perform environmental testing on the E-Navcon for Tideland Signal Corporation. Enclosed is the environmental test report with test details, charts, and photographs.

If you have any questions or comments about this report or the testing performed, feel free to contact me.

Sincerely,

Jeffrey A. Lenk
President

Enclosure

Project 13862-30

**Tideland Signal Corporation
E-Navcon**

Environmental Test Report

Prepared for:

Tideland Signal Corporation
4310 Directors Row
Houston, Texas 77092

By

Professional Testing (EMI), Inc.
1601 North A.W. Grimes Blvd., Suite B
Round Rock, Texas 78665

December 5, 2012

Reviewed by



Yuki Fukuda
Reliability Engineer

Written by



Tara Duval
Technical Writer

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(3) The significance of this report is dependent on the representative character of the test sample submitted for evaluation and the results apply only in reference to the sample tested. The manufacturer must continuously implement the changes shown herein to attain and maintain the required degree of compliance.



Test Summary

Applicant: Tideland Signal Corporation
 Applicant's Address: 4310 Directors Row
 Houston, Texas 77092

Model: E-Navcon
 Serial Number: 7065
 Part Number: E_NAVCON
 Project Number: 13862-30

The **E-Navcon** by **Tideland Signal Corporation** was subjected to testing as detailed in the table below.

Test Type	Specifications	Test Conditions	Date	Result
Dry Heat (Storage)	IEC 60945, Sec 8.2.2 IEC 60068-2-2	+70° C up to 16 hrs	11/12/2012 to 11/14/2012	Pass
Dry Heat (Operational)	IEC 60945, Sec 8.2.1 IEC 60068-2-2	+55° C up to 16 hrs	11/12/2012 to 11/14/2012	Pass
Damp Heat	IEC 60945, Sec 8.3 IEC 60068-2-30	+40° C / 93% RH 1 cycle = 24 hrs	11/17/2012 to 11/18/2012	Pass
Low Temperature (Operational)	IEC 60945, Sec 8.4.2 IEC 60068-2-1	-25° C up to 24 hrs	11/16/2012 to 11/17/2012	Pass
Vibration	ISO 13628-6: 2006, Sec 11.2.5.2.1, Q2	+/- 2 mm displacement at 5-25 Hz, 5 G 25-150 Hz, 1 oct/min. A double sweep from 5-150 Hz back to 5Hz, 3 axes. 2 hour endurance test in one axis	11/20/2012 to 11/21/2012	Pass
Shock	ISO 13628-6: 2006, Sec 11.2.5.2.2, Q2	Half-sine, 10 G at 11 ms, 4 pulses, +/- in each axis, 3 axes	11/20/2012	Pass

1.0 Introduction

1.1 Scope

This report describes the extent to which the equipment under test (EUT) conformed to the requirements specified by IEC 60945 Ed 4: 2002-08 and ISO 13628-6: 2006, as well as Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/2012. Passing test results indicate that the EUT is compliant with those specifications, and therefore, can operate in its environment without experiencing performance degradation.

1.2 EUT Description

The EUT is the **E-Navcon** by **Tideland Signal Corporation**. The EUT is a navigational aid comprised of an AIS AtoN device and an X-Brand Racon. Both devices are housed in the same enclosure and function independently of one another. The device is intended for use on land, stationary off-shore platforms, buoys, or other stationary locations where navigational aid is required. The system tested consisted of the following:

EUT	Manufacturer	Model	Serial #	Part #	Description
	Tideland Signal Corporation	E-Navcon	7065	E_NAVCON	Navigational Aid
Remote Equipment	Tideland Signal Corporation	Junction Box	None		Junction Box
	Dell	Latitude C610 Notebook	CN-0X076-48643-64C-5563		Notebook to Monitor EUT Functions
Cables	Quantity	Length	Shielded or Unshielded?		Description
	1	20 feet	Shielded		Serial Port from Cable to Computer
	1	15 feet	Shielded		Cable Bundle from Junction Box to EUT

1.3 EUT Operation

The EUT was tested while in an operational state for some tests, and in a non-operational state for other tests, as noted in the test results below.

1.4 Modifications to Equipment

No modifications were made to the EUT during the performance of the test program.

2.0 Applicable Documents

The following documents were used as reference for the test procedures specified herein.

Document Number	Document Title	Date of Publication
IEC 60945	Maritime navigation and radiocommunication equipment and systems – General requirements – Methods of testing and required test results	2002
ISO 13628-6	Petroleum and natural gas industries – Design and operation of subsea production systems – Part 6: Subsea production control systems, Second edition	2006
IEC 60068-2-1	Environmental testing – Part 2-1: Tests – Test A: Cold	2007
IEC 60068-2-2	Environmental testing – Part 2-2: Tests – Test B: Dry heat, Edition 5.0	2007
IEC 60068-2-30	Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle), Ed. 3.0	2005
N/A	Tideland Signal Test Plan for E-Navcon, Rev 0.3	6/4/2012

3.0 Environmental Testing Preparation and Setup

Environmental Testing Preparation and Setup

3.1 Test Site

Testing was performed at the Professional Testing, located in Round Rock, Texas. Professional Testing is an independent test laboratory, accredited by NVLAP, that provides a wide variety of regulatory and reliability testing services to the high-tech electronics industry.

3.2 Measurement Accuracy

The accuracy of instruments and test equipment is verified periodically. All instruments and test equipment used conform to laboratory standards with calibration traceable to prime standards at the U.S. National Institute of Standards and Technology.

3.3 Test Instrumentation

3.3.1 Equipment Nomenclature

The test instruments used for each test are listed in the applicable section of this test report. Each instrument was in calibration according to NIST standards.

4.0 Environmental Tests

4.1 Dry Heat Test

The objective of the dry heat tests was to verify the ability of the equipment to withstand high temperature conditions, which may be experienced during use and storage, without exhibiting degradation in performance during or after the test.

4.1.1 Test Procedures

On November 12 through 14, 2012, the EUT was subjected to dry heat testing according to the Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12, IEC 60945, Sections 8.2.1 and 8.2.2, and IEC 60068-2-2.

The dry heat (storage) test was conducted at $+70^{\circ}\text{C} \pm 3^{\circ}\text{C}$, for a period of 10 to 16 hours. Upon completion of the test, EUT operation was verified at ambient environmental conditions.

With the EUT operational, the dry heat (operational) test was conducted at $+55^{\circ}\text{C} \pm 3^{\circ}\text{C}$, for a period of 10 to 16 hours. The EUT operation was verified using Racon self-test and AIS presentation logging throughout the test.

4.1.2 Test Results

The EUT passed the performance check post dry heat test. No physical damage to the unit was observed. The EUT passed the requirements per IEC 60945, Sections 8.2.1 and 8.2.2.

Table 4.1.2.1: Dry Heat Test Equipment

Professional Testing, EMI, Inc.					
In Accordance With:		Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 IEC 60945 and IEC 60068-2-2			
Test Method:		Dry Heat			
Test Date:		11/12 – 11/14/2012		EUT Serial #:	SN 7065
Customer:		Tideland Signal Corporation		EUT Part #:	E_NAVCON
Project Number:		13862-30		Test Technician:	Dan Willemin
Purchase Order #:		116585		Supervisor:	Yuki Fukuda
Equip. Under Test:		E-Navcon			
Dry Heat Test Equipment List					Page 1 of 1
Asset #	Manufacturer	Model	Equipment Nomenclature	Serial #	Calibration Due Date
0525	Tenney	T40RS	Chamber, Temp. & Humidity	12334	11/09/2013
0360	Fluke	2625A	Hydra Data Logger	5788600	9/06/2013
1544	Astron	RS-12A	Power Supply, DC	91041363	NCR*
NA	IBM	Thinkpad	Laptop	32P4414	NCR*

*NCR = No calibration required

Table 4.1.2.2: Dry Heat Test Results, Page 1

Professional Testing, EMI, Inc.			
In Accordance With:	Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 and IEC 60945 and IEC 60068-2-2		
Test Method:	Dry Heat		
Test Date:	11/12 – 11/14/2012	EUT Serial #:	SN 7065
Customer:	Tideland Signal Corporation	EUT Part #:	E_NAVCON
Project Number:	13862-30	Test Technician:	Dan Willemin
Purchase Order #:	116585	Supervisor:	Yuki Fukuda
Equip. Under Test:	E-Navcon		
Dry Heat Test Results			Page 1 of 3
Dry Heat (Storage) Test +70° C ± 3° C, for a period of 10 h to 16 h. At the end of the test, the EUT shall be returned to normal environmental conditions and then subjected to a performance check		Pass	
Dry Heat (Operational) Test +55 °C ± 3 °C, for a period of 10 h to 16 h. EUT operational during test At the end of the test, the EUT shall be returned to normal environmental conditions and then subjected to a performance check		Pass	

Table 4.1.2.3: Dry Heat Temperature Test Results, Page 2

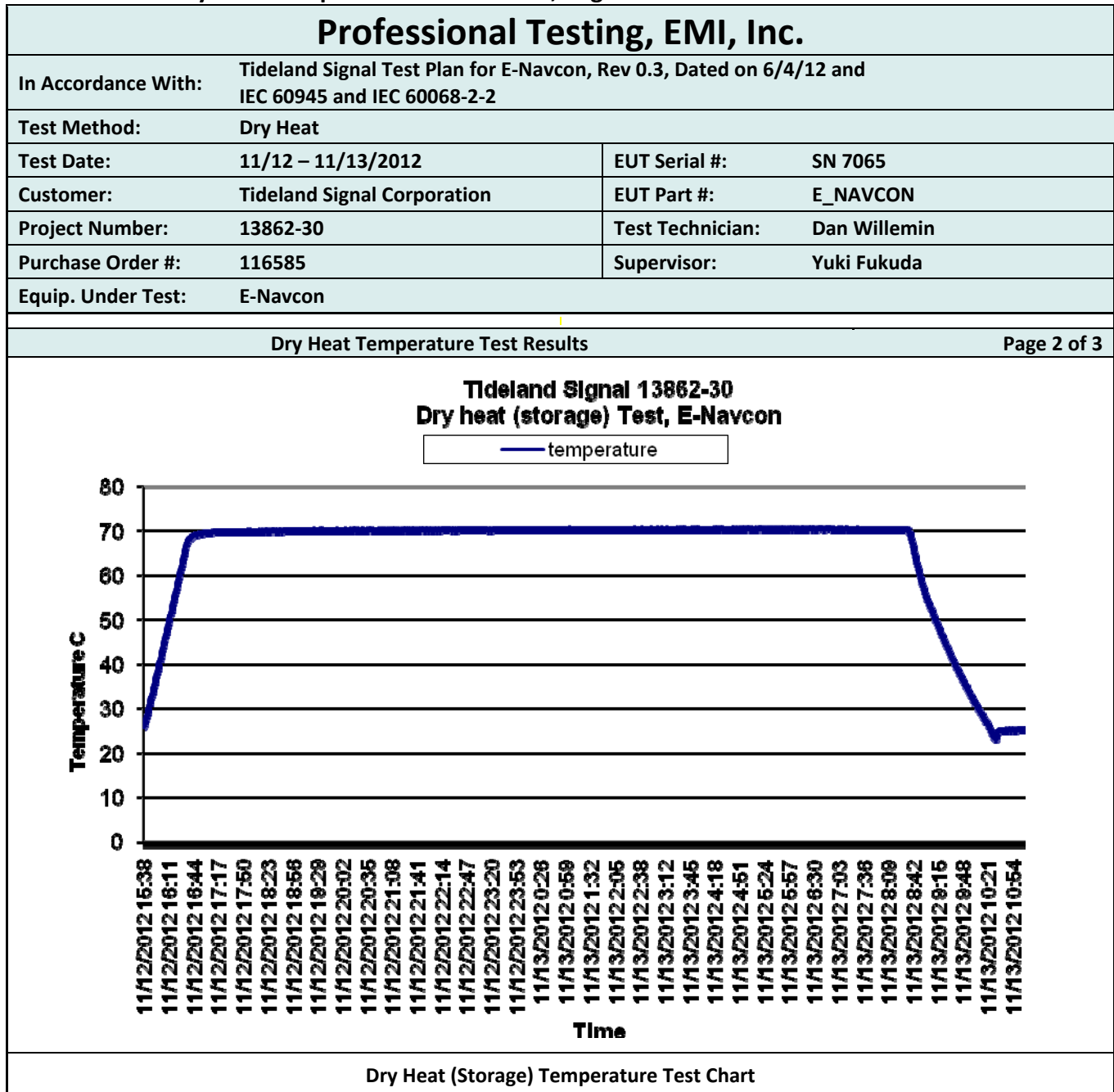


Table 4.1.2.4: Dry Heat Temperature Test Results, Page 3

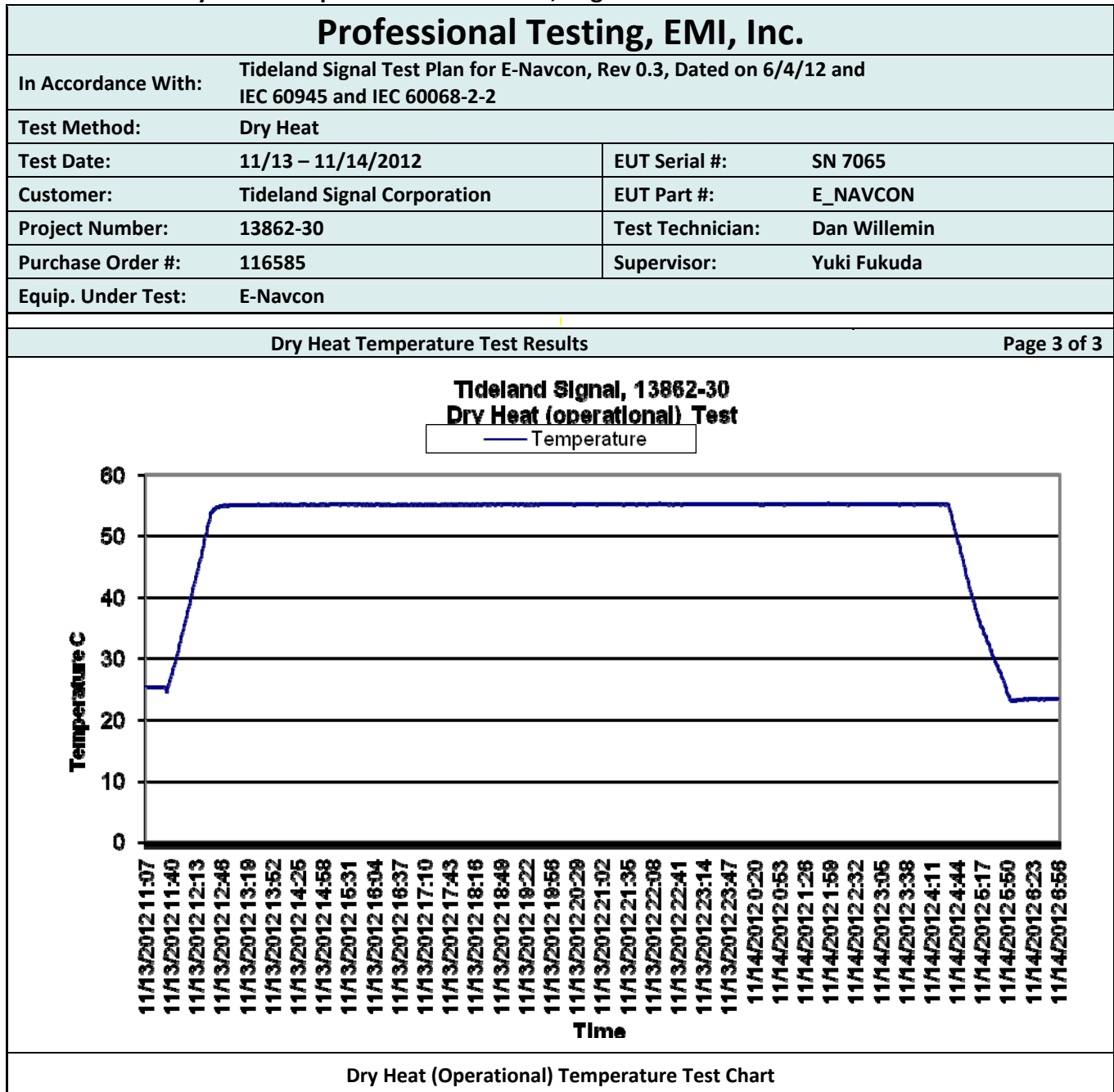


Table 4.1.2.5: Dry Heat Temperature Test Photographs

Professional Testing, EMI, Inc.			
In Accordance With:	Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 and IEC 60945 and IEC 60068-2-2		
Test Method:	Dry Heat		
Test Date:	11/12 – 11/14/2012	EUT Serial #:	SN 7065
Customer:	Tideland Signal Corporation	EUT Part #:	E_NAVCON
Project Number:	13862-30	Test Technician:	Dan Willemin
Purchase Order #:	116585	Supervisor:	Yuki Fukuda
Equip. Under Test:	E-Navcon		
Dry Heat Temperature Test Photographs			Page 1 of 1
			
EUT in Thermal Chamber		Functional Test Setup	

4.2 Damp Heat and Low Temperature Tests

The objective of the damp heat and cold tests was to verify the ability of the equipment to withstand high humidity and low temperature conditions without exhibiting degradation in performance.

4.2.1 Test Procedures

On November 17 through 18, 2012, the EUT was subjected to damp heat, and on November 16 through 17, 2012, it was subjected to low temperature testing. Testing was performed according to the Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12, IEC 60945, Sections 8.3 and 8.4.2, IEC 60068-2-30, and IEC 60068-2-1.

For the damp heat test, the chamber temperature was raised to $+40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and $93\% \pm 3\%$ over 3 hours. The conditions were maintained at $40^{\circ}\text{C}/93\%\text{RH}$ for 10 to 16 hours. The EUT was powered on and operated for at least 2 hours. At the end of the test period, the chamber temperature was ramped-down to room temperature in not less than 1 hour. At the end of the test, the EUT was returned to normal environmental conditions.

For the low temperature test, the EUT was subjected to a temperature of $-25^{\circ}\text{C} \pm 3^{\circ}\text{C}$ for up to 24 hours. The EUT was operational during this test.

EUT operation was verified using Racon self-test and AIS presentation logging throughout the both tests.

4.2.2 Test Results

The EUT passed the performance check during and post-damp heat test. No physical damage to the unit was observed. The EUT met the requirements per IEC 60945, Sections 8.3.

The EUT passed the performance check during and post-low temperature test, except that the Racon self-test indicated failure when the unit was turned on at -25°C . After a short interval, the self-test was repeated, and the EUT passed the self-test. Per the client, Racon will be operating continuously in any normal installation, so this was not considered a failure. No physical damage was observed post-low temperature test. The EUT met the requirements per IEC 60945, Section 8.4.2

Table 4.2.2.1: Damp Heat and Cold Test Equipment

Professional Testing, EMI, Inc.					
In Accordance With:		Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 IEC 60945, IEC 60068-2-30, and IEC 60068-2-1			
Test Method:		Damp Heat and Cold			
Test Date:		11/16 – 11/18/2012		EUT Serial #:	SN 7065
Customer:		Tideland Signal Corporation		EUT Part #:	E_NAVCON
Project Number:		13862-30		Test Technician:	Dan Willemin
Purchase Order #:		116585		Supervisor:	Yuki Fukuda
Equip. Under Test:		E-Navcon			
Damp Heat and Cold Test Equipment List					Page 1 of 1
Asset #	Manufacturer	Model	Equipment Nomenclature	Serial #	Calibration Due Date
0983	Envirotronics	N/A	Chamber, Environmental	None	2/07/2013
0360	Fluke	2625A	Hydra Data Logger	5788600	9/06/2013
1544	Astron	RS-12A	Power Supply, DC	91041363	NCR*
NA	IBM	Thinkpad	Laptop	32P4414	NCR*

*NCR = No calibration required

Table 4.2.2.2: Damp Heat Test Results, Page 1

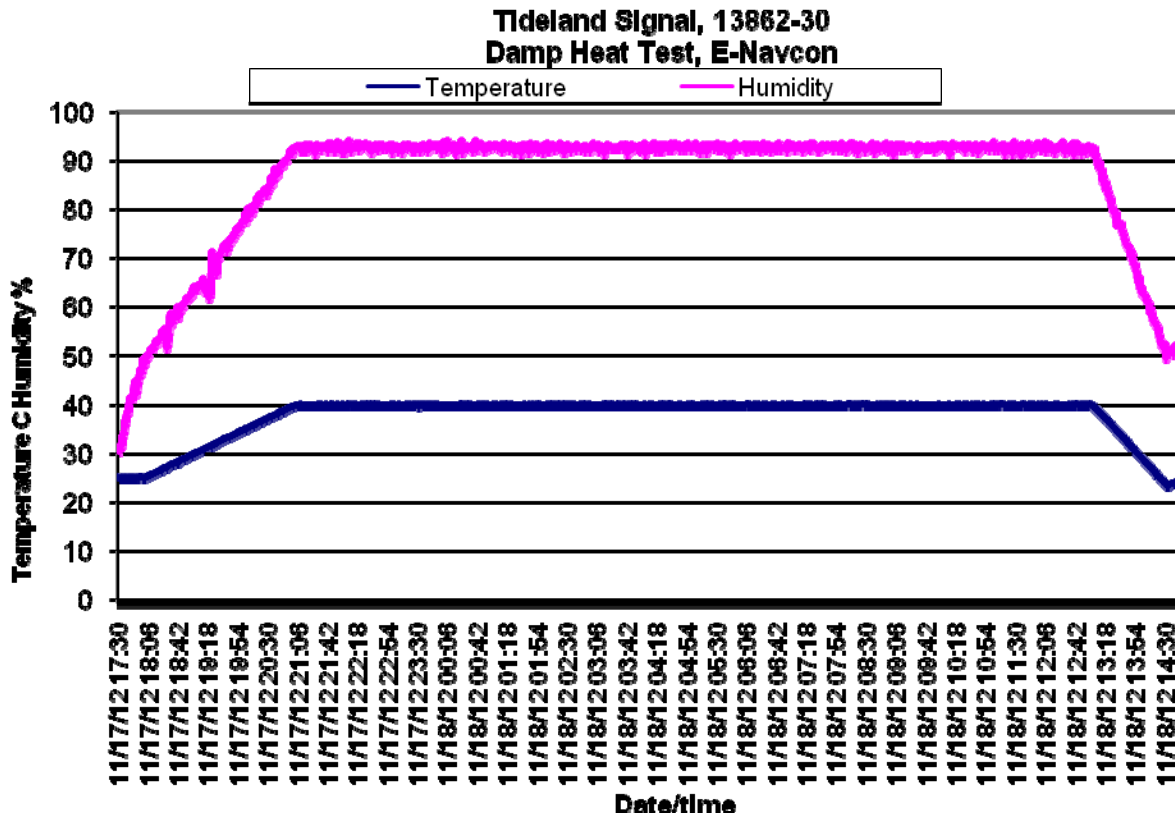
Professional Testing, EMI, Inc.	
In Accordance With: Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 and IEC 60945 and IEC 60068-2-30	
Test Method: Damp Heat	
Test Date:	11/17 – 11/18/2012
EUT Serial #:	SN 7065
Customer:	Tideland Signal Corporation
EUT Part #:	E_NAVCON
Project Number:	13862-30
Test Technician:	Dan Willemin
Purchase Order #:	116585
Supervisor:	Yuki Fukuda
Equip. Under Test: E-Navcon	
Damp Heat Test Results	
Page 1 of 2	
Damp Heat Test Chamber temperature was raised to +40° C ± 2° C and 93% ± 3% over 3 hours. The conditions were maintained at 40° C/93% RH for 10 to 16 hours. The EUT was powered on and operated for at least 2 hours. At the end of the test period, the chamber temperature was ramped-down to room temperature in not less than 1 hour. At the end of the test, the EUT was returned to normal environmental conditions.	
Pass	

Table 4.2.2.3: Damp Heat Test Results, Page 2

Professional Testing, EMI, Inc.			
In Accordance With:	Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 IEC 60945 and IEC 60068-2-30		
Test Method:	Damp Heat		
Test Date:	11/17 – 11/18/2012	EUT Serial #:	SN 7065
Customer:	Tideland Signal Corporation	EUT Part #:	E_NAVCON
Project Number:	13862-30	Test Technician:	Dan Willemin
Purchase Order #:	116585	Supervisor:	Yuki Fukuda
Equip. Under Test:	E-Navcon		

Damp Heat Test Results

Page 2 of 2



Damp Heat Temperature Test Chart

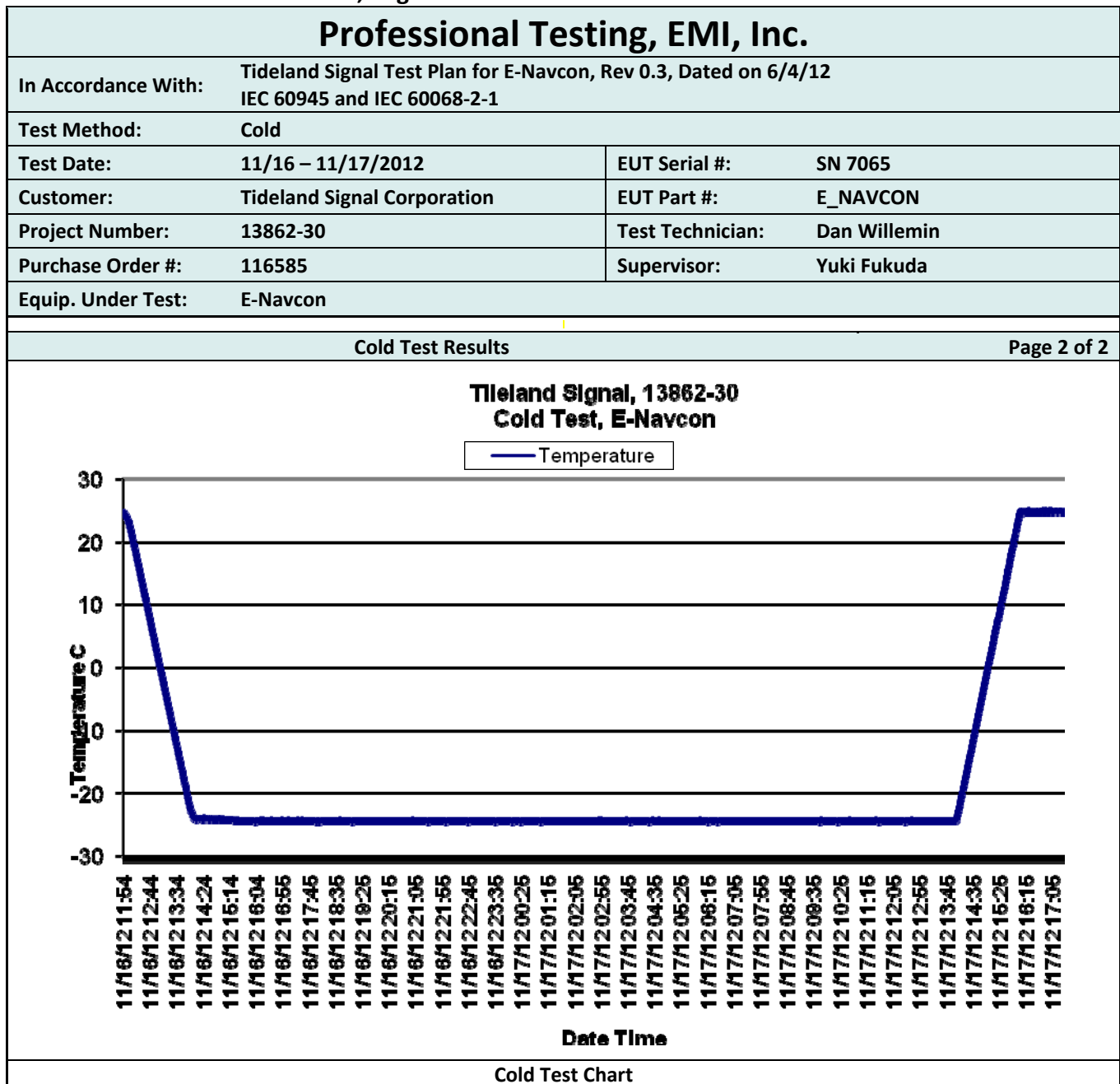
Table 4.2.2.4: Damp Heat and Cold Temperature Test Photographs, Page 1

Professional Testing, EMI, Inc.			
In Accordance With:	Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 IEC 60945, IEC 60068-2-30, and IEC 60068-2-1		
Test Method:	Damp Heat and Cold		
Test Date:	11/16 – 11/18/2012	EUT Serial #:	SN 7065
Customer:	Tideland Signal Corporation	EUT Part #:	E_NAVCON
Project Number:	13862-30	Test Technician:	Dan Willemin
Purchase Order #:	116585	Supervisor:	Yuki Fukuda
Equip. Under Test:	E-Navcon		
Damp Heat and Cold Temperature Test Photographs			Page 1 of 1
			
EUT in Thermal Chamber		Functional Test Setup	

Table 4.2.2.5: Cold Test Results, Page 1

Professional Testing, EMI, Inc.			
In Accordance With:	Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 IEC 60945 and IEC 60068-2-1		
Test Method:	Cold		
Test Date:	11/16 – 11/17/2012	EUT Serial #:	SN 7065
Customer:	Tideland Signal Corporation	EUT Part #:	E_NAVCON
Project Number:	13862-30	Test Technician:	Dan Willemin
Purchase Order #:	116585	Supervisor:	Yuki Fukuda
Equip. Under Test:	E-Navcon		
Cold Test Results			Page 1 of 2
Cold Test –25° C ± 3° C for up to 24 hours. The EUT was operational during the test.		Pass	

Table 4.2.2.6: Cold Test Results, Page 2



4.3 Vibration and Shock Tests

The objective of the vibration and shock tests was to verify the ability of the equipment to withstand vibration and shock stress, which may be experienced during use and transportation without exhibiting degradation in performance or structural damage.

4.3.1 Test Procedures

On November 20 through 21, 2012, the EUT was subjected to vibration and shock testing. Tests were conducted according to ISO 13628-6: 2006, Sections 11.2.5.2.1 and 11.2.5.2.2, Q2 requirement.

The EUT was subjected to sinusoidal vibration sweep from 5Hz to 25Hz with +/- 2 mm displacement, then from 25 Hz to 150 Hz at 5 G acceleration. A double sweep from 5 Hz to 150 Hz and back to 5 Hz was performed at a sweep rate of 1 octave per minute in each of the three orthogonal axes. The EUT was further subjected to random vibration endurance test per Figure 3 of ISO 13628-6: 2006. The composite excitation level was 6Grms, 20-2000Hz and test was performed for duration of 2 hours in Z axis.

The EUT was subjected to half-sine shock testing at 10 G at 11 ms, four pulses, +/- in each axis for all three axes.

During vibration and shock test, the EUT operation was verified using Racon self-test and AIS presentation logging.

4.3.2 Test Results

The EUT showed no damage post-vibration and shock tests. No resonance with mechanical amplification factor greater than 10 was observed in the range 5 Hz to 150 Hz during sinusoidal vibration test. The EUT passed the performance check during and after the vibration and shock test. The EUT met the requirements of ISO 13628: 2006, Sections 11.2.5.2.1 and 11.2.5.2.2, Q2.

Table 4.3.2.1: Vibration and Shock Test Equipment

Professional Testing, EMI, Inc.					
In Accordance With:		Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 and ISO 13628-6			
Test Method:		Vibration and Shock		Section:	Section 5.4.6
Test Date:		11/20 and 11/21/2012		EUT Serial #:	SN 7065
Customer:		Tideland Signal Corporation		EUT Part #:	E_NAVCON
Project Number:		13862-30		Test Technician:	John Crawford
Purchase Order #:		116585		Supervisor:	Yuki Fukuda
Equip. Under Test:		E-Navcon			
Vibration and Shock Test Equipment List					Page 1 of 1
Asset #	Manufacturer	Model	Equipment Nomenclature	Serial #	Calibration Due Date
1533	Dactron	V2.10	Shaker Controller	7221624	12/20/2012
1070	Dactron	V2.0	PCI DSP Card	3410179	N/A
1534	Ling	DMA4016E	Power Amp	035	N/A
1535	Ling	335VH	Shaker Table	154	N/A
1556	Endevco	133	Signal Conditioner	AF49	06/19/2013
2035	Dytran	3055B1G	Accelerometer	8952	10/12/2013
1618	Dytran	3055B1G	Accelerometer	3993	06/02/2013
2019	Dytran	3055B1G	Accelerometer	8732	06/07/2013

Table 4.3.2.2: Vibration and Shock Data Channel Designation

Professional Testing, EMI, Inc.		
In Accordance With:		Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 and ISO 13628-6
Test Method:	Vibration and Shock	Section: Section 5.4.6
Test Date:	11/20 and 11/21/2012	EUT Serial #: SN 7065
Customer:	Tideland Signal Corporation	EUT Part #: E_NAVCON
Project Number:	13862-30	Test Technician: John Crawford
Purchase Order #:	116585	Supervisor: Yuki Fukuda
Equip. Under Test:	E-Navcon	
Vibration Data Channel		Page 1 of 1
Input Channel	Description	Color
Input 1 (8952)	C1 Control on end of slip table in X & Y axis & on fixture in Z axis	Black
Input 2 (3993)	C2 Control on fixture in Z axis only for Random vibrate	Black
Input 3 (8732)	R1 Response on unit above connector in axis	Red

Table 4.3.2.3: Vibration Test Results, Page 1

Professional Testing, EMI, Inc.			
In Accordance With:	Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 and ISO 13628-6		
Test Method:	Vibration	Section:	Section 5.4.6
Test Date:	11/20 and 11/21/2012	EUT Serial #:	SN 7065
Customer:	Tideland Signal Corporation	EUT Part #:	E_NAVCON
Project Number:	13862-30	Test Technician:	John Crawford
Purchase Order #:	116585	Supervisor:	Yuki Fukuda
Equip. Under Test:	E-Navcon		
Vibration Test Results			Page 1 of 8
	X Axis	Y Axis	Z Axis
Sine Sweep Vibration: 5 Hz to 25 Hz +/- 2 mm displacement at 3 dB per octave rise, 25 Hz to 150 Hz at 5 G acceleration, at 1 octave per minute. A double sweep from 5 Hz to 150 Hz and back to 5 Hz shall be performed in all 3 axes.	Pass Run #1	Pass Run #2	Pass Run #3
Random Vibration: 20 Hz to 80 Hz at 3 dB per octave rise, 80 Hz to 350 Hz at 0.04 g ² /Hz, 350 Hz to 2000 Hz at 3 dB per octave roll off. Composite 6 Grms for 2 hours in Z axis only	Not Required	Not Required	Pass Run #4

Table 4.3.2.4: Vibration Test Results, Page 2

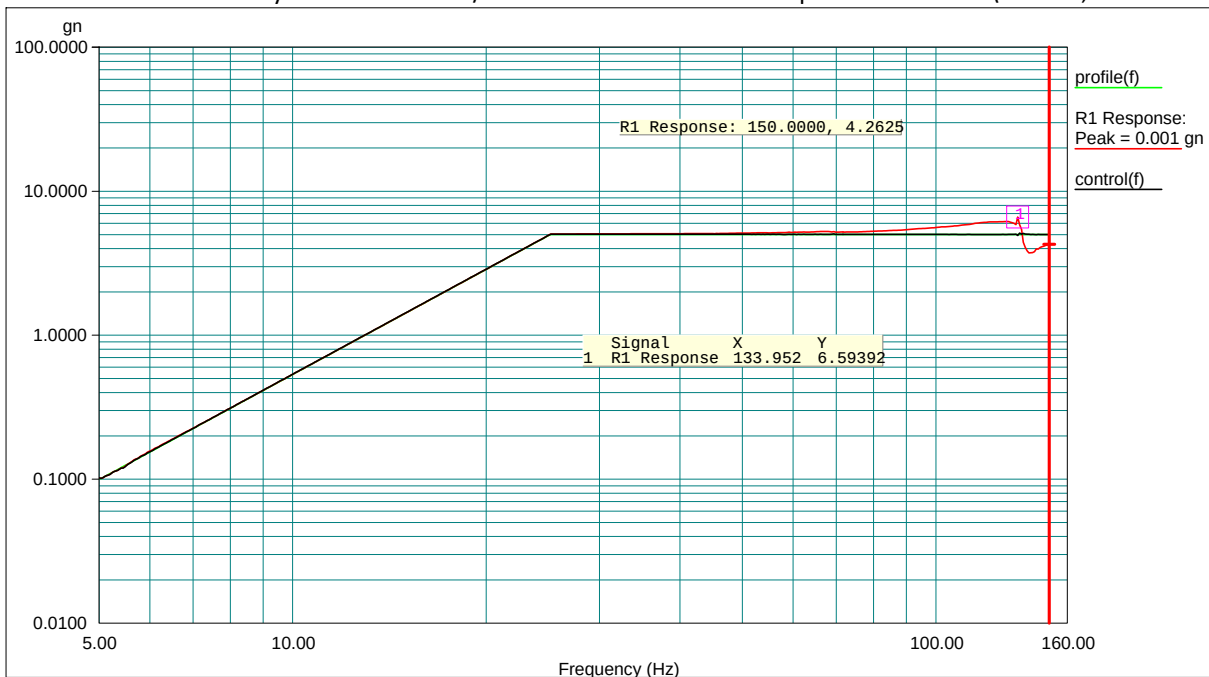
Professional Testing, EMI, Inc.									
In Accordance With:		Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 and ISO 13628-6							
Test Method:	Vibration	Section:	Section 5.4.6						
Test Date:	11/20 and 11/21/2012	EUT Serial #:	SN 7065						
Customer:	Tideland Signal Corporation	EUT Part #:	E_NAVCON						
Project Number:	13862-30	Test Technician:	John Crawford						
Purchase Order #:	116585	Supervisor:	Yuki Fukuda						
Equip. Under Test:	E-Navcon								
Vibration Test Results			Page 2 of 8						
Run # 1 X axis Sine Survey 5G		PN E-NAVCON SN 7065	R1 marked sweep up						
Project File Name: ISO 13628-6 5G sine 5-150Hz.prj									
Profile Name: Sine Survey 5 to 150 Hz 1 oct/min 5G		Test: Swept Sine	Run : \ Nov 20, 2012 13-57-42						
 gn 100.0000 10.0000 1.0000 0.1000 0.0100 5.00 10.00 100.00 160.00 Frequency (Hz) R1 Response: 150.0000, 4.2625 <table><thead><tr><th>Signal</th><th>X</th><th>Y</th></tr></thead><tbody><tr><td>1 R1 Response</td><td>133.952</td><td>6.59392</td></tr></tbody></table> profile(f) R1 Response: Peak = 0.001 gn control(f)				Signal	X	Y	1 R1 Response	133.952	6.59392
Signal	X	Y							
1 R1 Response	133.952	6.59392							
Level: 100 %		Control Peak: 4.996784 gn	Full Level Time: 00:04:55						
Sweep Type: Logarithmic		Frequency: 149.978378 Hz	Demand Peak: 5.000000 gn						
Time Remaining: 00:04:54		Sweep Rate: 1 Oct/Min							
Data saved at 02:03:09 PM, Tuesday, November 20, 2012									
Report created at 02:03:11 PM, Tuesday, November 20, 2012									
X Axis, Run #1, Sine Sweep Up									

Table 4.3.2.5: Vibration Test Results, Page 3

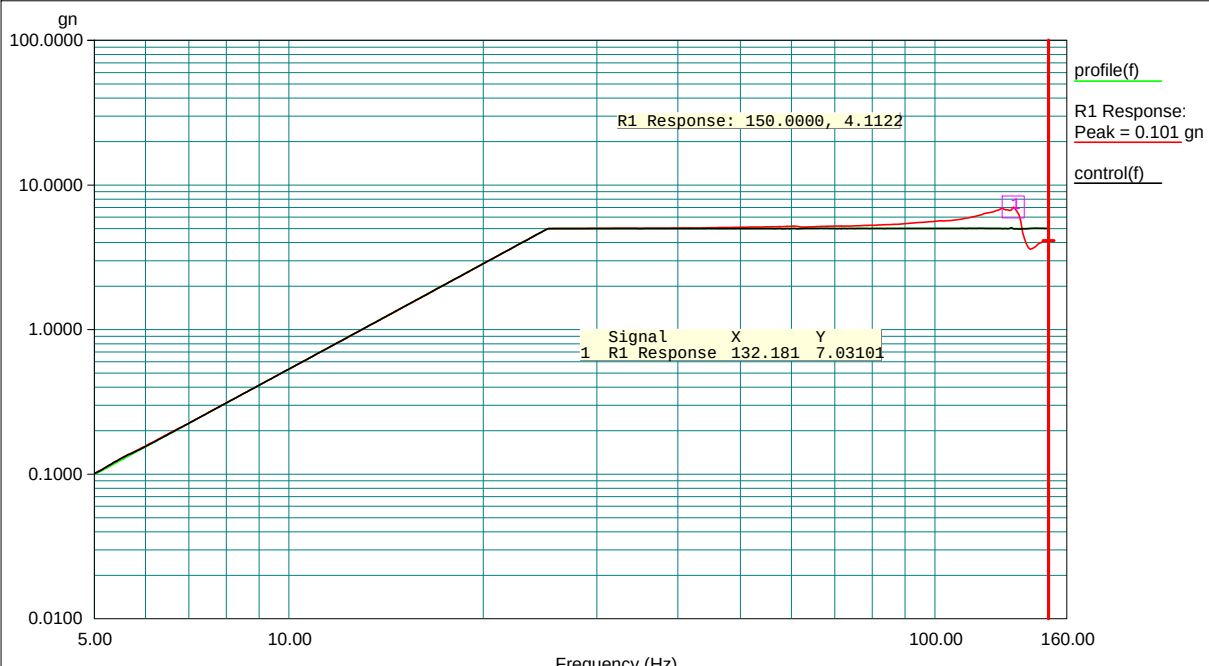
Professional Testing, EMI, Inc.			
In Accordance With:	Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 and ISO 13628-6		
Test Method:	Vibration	Section:	Section 5.4.6
Test Date:	11/20 and 11/21/2012	EUT Serial #:	SN 7065
Customer:	Tideland Signal Corporation	EUT Part #:	E_NAVCON
Project Number:	13862-30	Test Technician:	John Crawford
Purchase Order #:	116585	Supervisor:	Yuki Fukuda
Equip. Under Test:	E-Navcon		
Vibration Test Results			Page 3 of 8
Run # 1 X axis Sine Survey 5G		PN E-NAVCON SN 7065	R1 marked sweep down
Project File Name: ISO 13628-6 5G sine 5-150Hz.prj			
Profile Name: Sine Survey 5 to 150 Hz 1 oct/min 5G		Test Type: Swept Sine	Run: \ Nov 20, 2012 13-57-42
 gn 100.0000 10.0000 1.0000 0.1000 0.0100 5.00 10.00 100.00 160.00 Frequency (Hz) R1 Response: 150.0000, 4.1122 Signal X Y 1 R1 Response 132.181 7.03101 profile(f) R1 Response: Peak = 0.101 gn control(f)			
Level: 100 %	Control Peak: 0.101278 gn	Full Level Time:	00:09:49
Sweep Type: Logarithmic	Frequency: 5.002398 Hz	Demand Peak: 0.100642 gn	
Time Remaining: 00:00:01	Sweep Rate: 1 Oct/Min		
Data saved at 02:08:36 PM, Tuesday, November 20, 2012			
Report created at 02:08:37 PM, Tuesday, November 20, 2012			
X Axis, Run #1, Sine Sweep Down			

Table 4.3.2.6: Vibration Test Results, Page 4

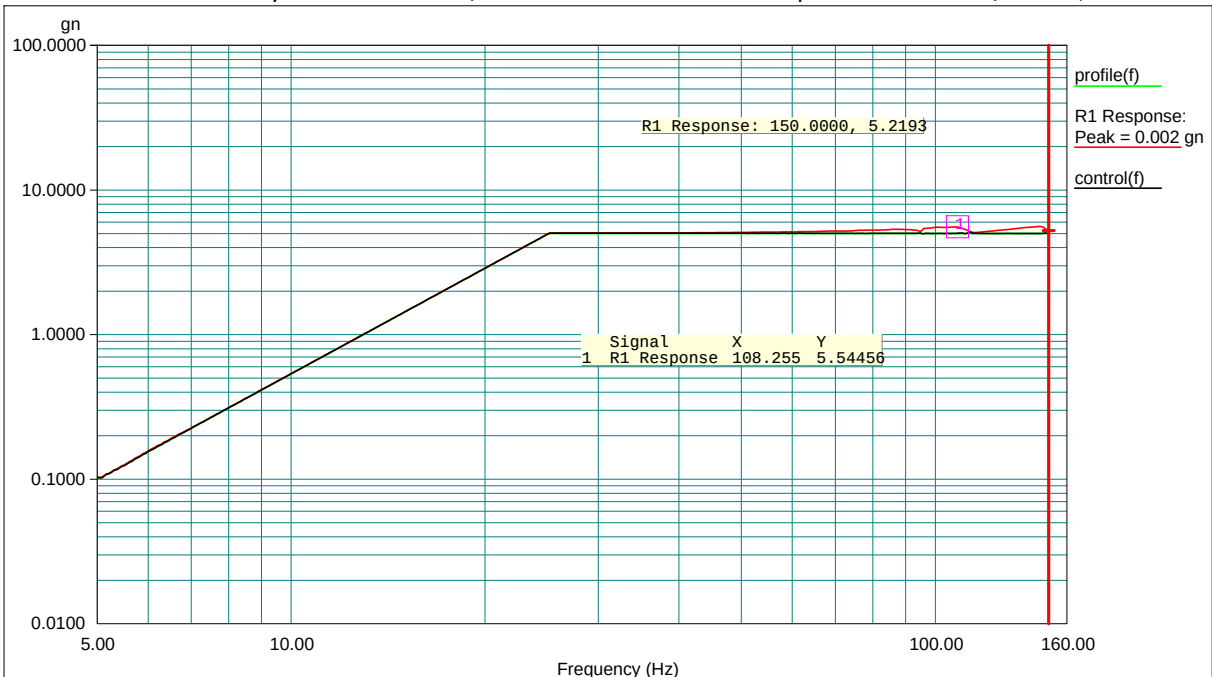
Professional Testing, EMI, Inc.			
In Accordance With:	Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 and ISO 13628-6		
Test Method:	Vibration	Section:	Section 5.4.6
Test Date:	11/20 and 11/21/2012	EUT Serial #:	SN 7065
Customer:	Tideland Signal Corporation	EUT Part #:	E_NAVCON
Project Number:	13862-30	Test Technician:	John Crawford
Purchase Order #:	116585	Supervisor:	Yuki Fukuda
Equip. Under Test:	E-Navcon		
Vibration Test Results			Page 4 of 8
Run # 2 Y axis Sine Survey 5G		PN E-NAVCON SN 7065	
Project File Name: ISO 13628-6 5G sine 5-150Hz.prj		R1 marked sweep up	
Profile Name: Sine Survey 5 to 150 Hz 1 oct/min 5G		Test: Swept Sine	Run : \ Nov 20, 2012 14-29-42
 gn 100.0000 10.0000 1.0000 0.1000 0.0100 5.00 10.00 100.00 160.00 Frequency (Hz) profile(f) R1 Response: 150.0000, 5.2193 R1 Response: Peak = 0.002 gn control(f) Signal X Y 1 R1 Response 108.255 5.54456			
Level: 100 %	Control Peak: 5.015955 gn	Full Level Time:	00:04:55
Sweep Type: Logarithmic	Frequency: 149.867661 Hz	Demand Peak: 5.000000 gn	
Time Remaining: 00:04:54	Sweep Rate: 1 Oct/Min		
Data saved at 02:35:22 PM, Tuesday, November 20, 2012			
Report created at 02:35:23 PM, Tuesday, November 20, 2012			
Y Axis, Run #2, Sine Sweep Up			

Table 4.3.2.7: Vibration Test Results, Page 5

Professional Testing, EMI, Inc.			
In Accordance With:		Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 and ISO 13628-6	
Test Method:	Vibration	Section:	Section 5.4.6
Test Date:	11/20 and 11/21/2012	EUT Serial #:	SN 7065
Customer:	Tideland Signal Corporation	EUT Part #:	E_NAVCON
Project Number:	13862-30	Test Technician:	John Crawford
Purchase Order #:	116585	Supervisor:	Yuki Fukuda
Equip. Under Test:		E-Navcon	
Vibration Test Results			Page 5 of 8
Run # 2 Y axis Sine Survey 5G		PN E-NAVCON SN 7065	R1 marked sweep down
Project File Name: ISO 13628-6 5G sine 5-150Hz.prj			
Profile Name: Sine Survey 5 to 150 Hz 1 oct/min 5G		Test Type: Swept Sine	Run : \ Nov 20, 2012 14-29-42
gn 100.0000 10.0000 1.0000 0.1000 0.0100 5.00 10.00 100.00 160.00 Frequency (Hz) R1 Response: 150.0000, 5.1551 SignalX Y 1 R1 Response134.8475.52047 profile(f) R1 Response: Peak = 0.101 gn control(f)			
Level: 100 %		Control Peak: 0.101365 gn	Full Level Time: 00:09:49
Sweep Type: Logarithmic		Frequency: 5.001781 Hz	Demand Peak: 0.100642 gn
Time Remaining: 00:00:01		Sweep Rate: 1 Oct/Min	
Data saved at 02:40:54 PM, Tuesday, November 20, 2012			
Report created at 02:40:55 PM, Tuesday, November 20, 2012			
Y Axis, Run #2, Sine Sweep Down			

Table 4.3.2.8: Vibration Test Results, Page 6

Professional Testing, EMI, Inc.			
In Accordance With:		Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 and ISO 13628-6	
Test Method:	Vibration	Section:	Section 5.4.6
Test Date:	11/20 and 11/21/2012	EUT Serial #:	SN 7065
Customer:	Tideland Signal Corporation	EUT Part #:	E_NAVCON
Project Number:	13862-30	Test Technician:	John Crawford
Purchase Order #:	116585	Supervisor:	Yuki Fukuda
Equip. Under Test:	E-Navcon		
Vibration Test Results		Page 6 of 8	
Run # 3 Z axis Sine Survey 5G		PN E-NAVCON SN 7065	
Project File Name: ISO 13628-6 5G sine 5-150Hz.prj		R1 sweep up	
Profile Name: Sine Survey 5 to 150 Hz 1 oct/min 5G		Test: Swept Sine Run: \ Nov 20, 2012 15-20-44	
gn 100.0000 10.0000 1.0000 0.1000 0.0100 5.00 10.00 100.00 160.00 Frequency (Hz) profile(f) R1 Response: Peak = 0.002 gn control(f)			
Level: 100 %		Control Peak: 5.017760 gn	
Sweep Type: Logarithmic		Frequency: 149.959915 Hz	
Time Remaining: 00:04:54		Sweep Rate: 1 Oct/Min	
Data saved at 03:26:16 PM, Tuesday, November 20, 2012		Full Level Time: 00:04:55	
Report created at 03:26:17 PM, Tuesday, November 20, 2012		Demand Peak: 5.000000 gn	
Z Axis, Run #3, Sine Sweep Up			

Table 4.3.2.9: Vibration Test Results, Page 7

Professional Testing, EMI, Inc.			
In Accordance With:		Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 and ISO 13628-6	
Test Method:	Vibration	Section:	Section 5.4.6
Test Date:	11/20 and 11/21/2012	EUT Serial #:	SN 7065
Customer:	Tideland Signal Corporation	EUT Part #:	E_NAVCON
Project Number:	13862-30	Test Technician:	John Crawford
Purchase Order #:	116585	Supervisor:	Yuki Fukuda
Equip. Under Test:	E-Navcon		
Vibration Test Results			Page 7 of 8
Run # 3 Z axis Sine Survey 5G		PN E-NAVCON SN 7065	R1 sweep down
Project File Name: ISO 13628-6 5G sine 5-150Hz.prj			
Profile Name: Sine Survey 5 to 150 Hz 1 oct/min 5G Test : Swept Sine Run: \ Nov 20, 2012 15-20-44			
gn 100.0000 10.0000 1.0000 0.1000 0.0100 5.00 10.00 100.00 160.00 Frequency (Hz) profile(f) R1 Response: Peak = 0.099 gn C1 Control : Peak = 0.100 gn			
Level: 100 %		Control Peak: 0.100167 gn	Full Level Time: 00:09:49
Sweep Type: Logarithmic		Frequency: 5.001781 Hz	Demand Peak: 0.100642 gn
Time Remaining: 00:00:01 Sweep Rate: 1 Oct/Min			
Data saved at 03:32:27 PM, Tuesday, November 20, 2012			
Report created at 03:32:28 PM, Tuesday, November 20, 2012			
Z Axis, Run #3, Sine Sweep Down			

Table 4.3.2.10: Vibration Test Results, Page 8

Professional Testing, EMI, Inc.			
In Accordance With:	Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 and ISO 13628-6		
Test Method:	Vibration	Section:	Section 5.4.6
Test Date:	11/20 and 11/21/2012	EUT Serial #:	SN 7065
Customer:	Tideland Signal Corporation	EUT Part #:	E_NAVCON
Project Number:	13862-30	Test Technician:	John Crawford
Purchase Order #:	116585	Supervisor:	Yuki Fukuda
Equip. Under Test:	E-Navcon		
Vibration Test Results			Page 8 of 8
Run # 4 Z axis PN E-NAVCON SN 7065 End of 2 hours			
Project File Name: ISO 13628-6 Random 6.06 Grms 2 Hr.prj			
Profile Name: Random 6.06 Grms 2 Hrs Test: Random Run: \ Nov 21, 2012 06-44-46			
Level: 100 % Control RMS: 6.097196 gn Full Level Elapsed Time: 02:00:00 Lines: 1600 Frame Time: 0.800000 Seconds Demand RMS: 6.064654 gn Remaining Time: 00:00:00 DOF: 154 dF: 1.250000 Hz Data saved at 08:46:10 AM, Wednesday, November 21, 2012 Report created at 08:46:14 AM, Wednesday, November 21, 2012			
Z Axis, Run #4, Random Vibration			

Table 4.3.2.11: Vibration and Shock Test Photographs, Page 1

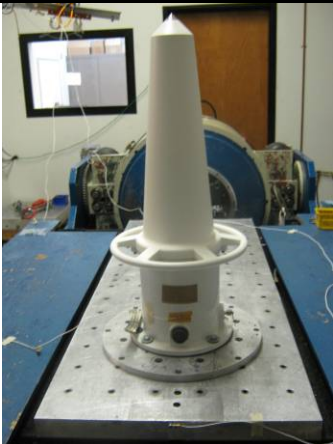
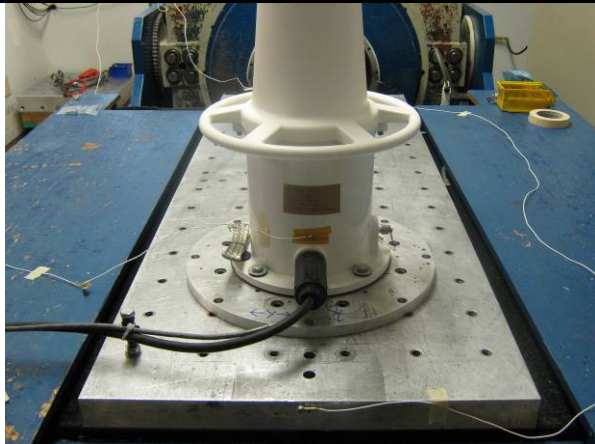
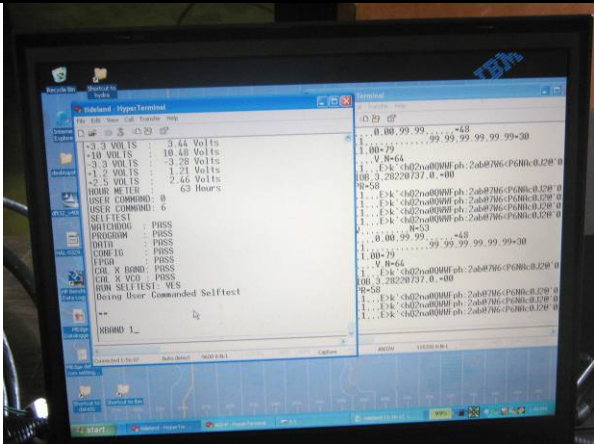
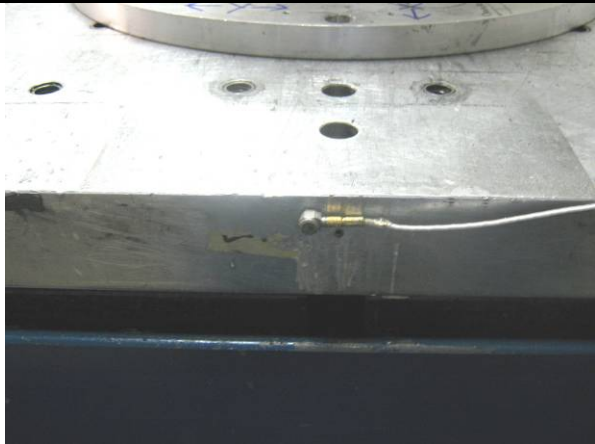
Professional Testing, EMI, Inc.			
In Accordance With:	Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 and ISO 13628-6		
Test Method:	Vibration and Shock	Section:	Section 5.4.6
Test Date:	11/20 and 11/21/2012	EUT Serial #:	SN 7065
Customer:	Tideland Signal Corporation	EUT Part #:	E_NAVCON
Project Number:	13862-30	Test Technician:	John Crawford
Purchase Order #:	116585	Supervisor:	Yuki Fukuda
Equip. Under Test:	E-Navcon		
Vibration and Shock Test Photographs			Page 1 of 4
			
X Axis, Test Setup		X Axis, Functional Test Setup	
			
X Axis, Functional Test Setup		C1 Control in X Axis	

Table 4.3.2.12: Vibration and Shock Test Photographs, Page 2

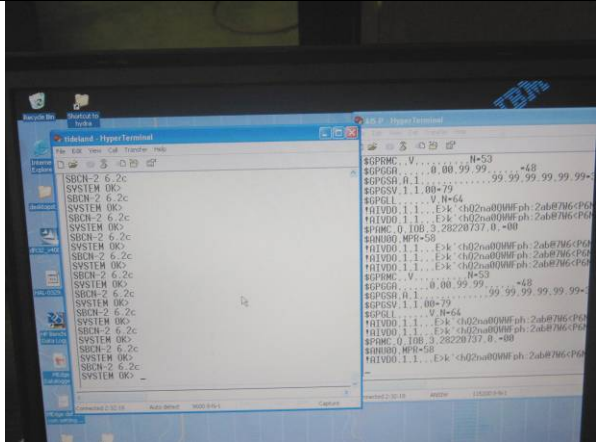
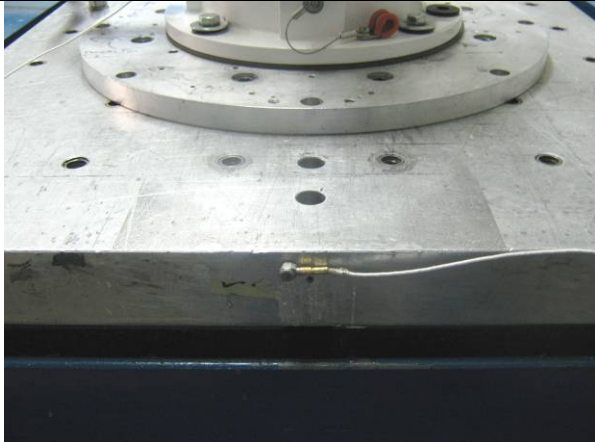
Professional Testing, EMI, Inc.			
In Accordance With:	Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 and ISO 13628-6		
Test Method:	Vibration and Shock	Section:	Section 5.4.6
Test Date:	11/20 and 11/21/2012	EUT Serial #:	SN 7065
Customer:	Tideland Signal Corporation	EUT Part #:	E_NAVCON
Project Number:	13862-30	Test Technician:	John Crawford
Purchase Order #:	116585	Supervisor:	Yuki Fukuda
Equip. Under Test:	E-Navcon		
Vibration and Shock Test Photographs			Page 2 of 4
			
R1 Response in X Axis		Y Axis, Test Setup	
			
Y Axis, Functional Test Setup		C1 Control in Y Axis	

Table 4.3.2.13: Vibration and Shock Test Photographs, Page 3

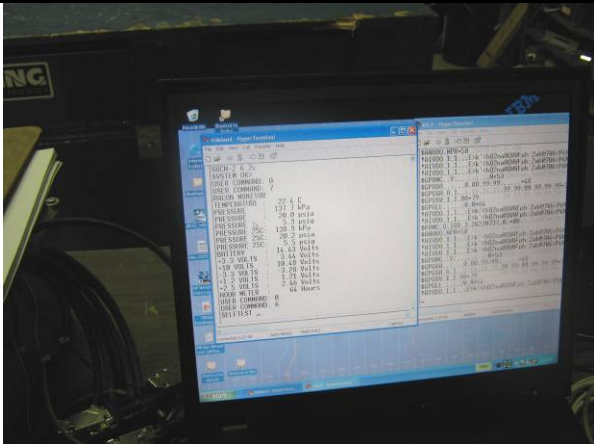
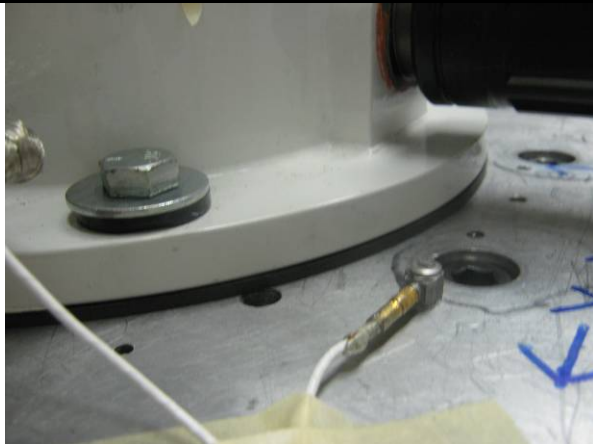
Professional Testing, EMI, Inc.			
In Accordance With:	Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 and ISO 13628-6		
Test Method:	Vibration and Shock	Section:	Section 5.4.6
Test Date:	11/20 and 11/21/2012	EUT Serial #:	SN 7065
Customer:	Tideland Signal Corporation	EUT Part #:	E_NAVCON
Project Number:	13862-30	Test Technician:	John Crawford
Purchase Order #:	116585	Supervisor:	Yuki Fukuda
Equip. Under Test:	E-Navcon		
Vibration and Shock Test Photographs			Page 3 of 4
			
R1 Response in Y Axis		Z Axis, Test Setup	
			
Z Axis, Functional Test Setup		C1 Control in Z Axis	

Table 4.3.2.14: Vibration and Shock Test Photographs, Page 4

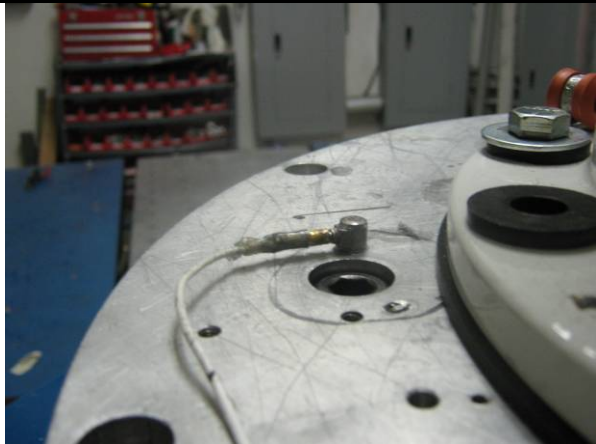
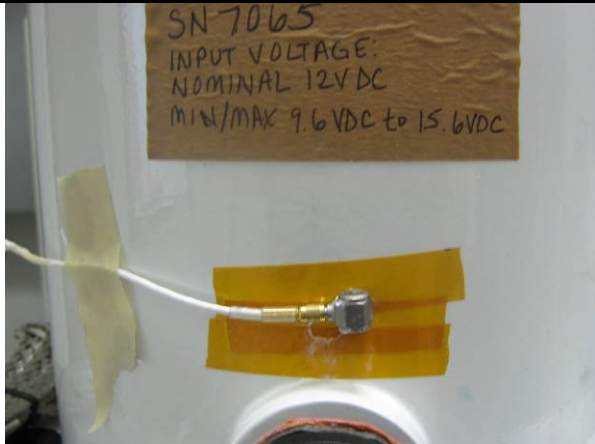
Professional Testing, EMI, Inc.			
In Accordance With:	Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 and ISO 13628-6		
Test Method:	Vibration and Shock	Section:	Section 5.4.6
Test Date:	11/20 and 11/21/2012	EUT Serial #:	SN 7065
Customer:	Tideland Signal Corporation	EUT Part #:	E_NAVCON
Project Number:	13862-30	Test Technician:	John Crawford
Purchase Order #:	116585	Supervisor:	Yuki Fukuda
Equip. Under Test:	E-Navcon		
Vibration and Shock Test Photographs			Page 4 of 4
			
C2 Control in Z Axis		R1 Response in Z Axis	

Table 4.3.2.15: Shock Test Results, Page 1

Professional Testing, EMI, Inc.			
In Accordance With:	Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 and ISO 13628-6		
Test Method:	Shock	Section:	Section 5.4.6
Test Date:	11/20/2012	EUT Serial #:	SN 7065
Customer:	Tideland Signal Corporation	EUT Part #:	E_NAVCON
Project Number:	13862-30	Test Technician:	John Crawford
Purchase Order #:	116585	Supervisor:	Yuki Fukuda
Equip. Under Test:	E-Navcon		
Shock Test Results			Page 1 of 7
	X Axis	Y Axis	Z Axis
Shock: ISO 13628-6: 2006 Half sine 10 G, 11 ms, 4 shocks +/- each axis, 3 axes	Pass + / -	Pass + / -	Pass + / -

Table 4.3.2.16: Shock Test Results, Page 2

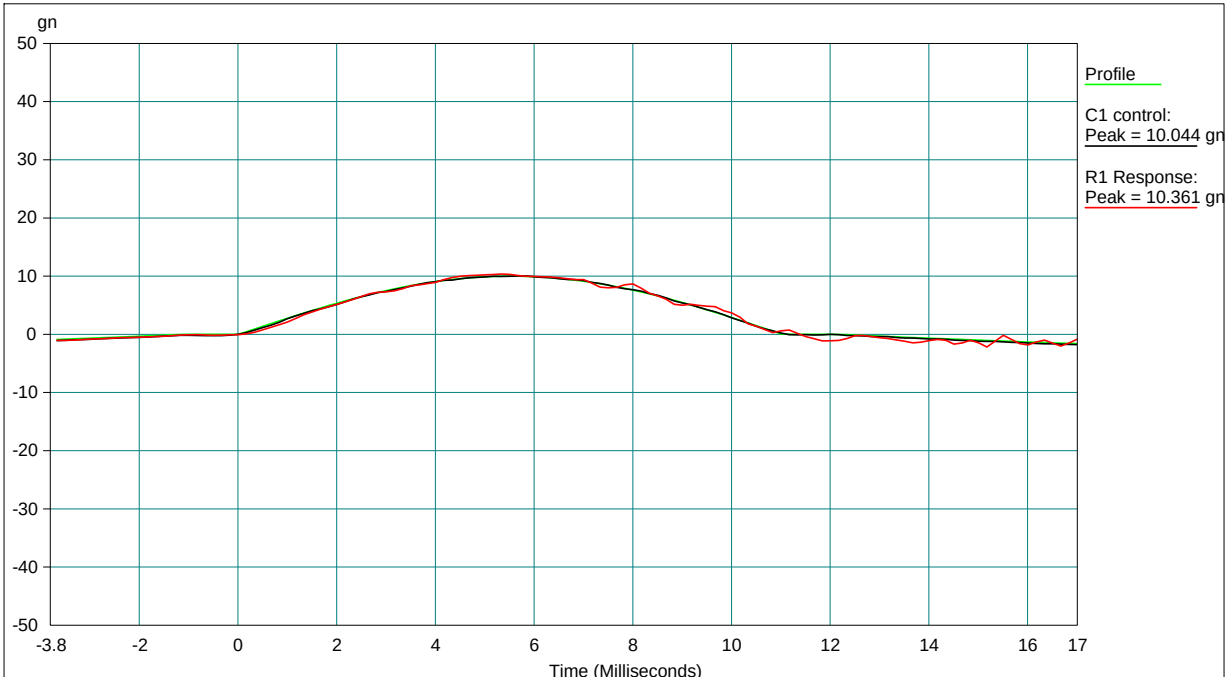
Professional Testing, EMI, Inc.			
In Accordance With:		Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 and ISO 13628-6	
Test Method:	Shock	Section:	Section 5.4.6
Test Date:	11/20/2012	EUT Serial #:	SN 7065
Customer:	Tideland Signal Corporation	EUT Part #:	E_NAVCON
Project Number:	13862-30	Test Technician:	John Crawford
Purchase Order #:	116585	Supervisor:	Yuki Fukuda
Equip. Under Test:	E-Navcon		
Shock Test Results			
Page 2 of 7			
+ X axis Op Shock 10g 11ms PN E-NAVCON SN 7065 Project File Name: ISO 13628-6 Shock Half Sine 10G 11ms.prj Profile Name: 10gn 11mSec Test Type: Classical Shock Run Folder: \Run Default Nov 20, 2012 13-50-22			
 gn 50 40 30 20 10 0 -10 -20 -30 -40 -50 -3.8 -2 0 2 4 6 8 10 12 14 16 17 Time (Milliseconds) Profile C1 control: Peak = 10.044 gn R1 Response: Peak = 10.361 gn			
Level: 100 % Block Size: 1024 Elapsed Pulses: 10 Frame Time: 0.170667 Seconds Control Peak: 10.043740 gn Control RMS: 2.025975 gn Full Level Elapsed Pulses: 4 dT: 0.000167 Seconds Demand Peak: 10.000000 gn Demand RMS: 2.006089 gn Remaining Pulses: 0 Pulse Type: Half Sine Amplitude: 10.000000 gn Data saved at 01:51:07 PM, Tuesday, November 20, 2012 Report created at 01:51:09 PM, Tuesday, November 20, 2012			
+ X Axis, Shock Test, 10 G, 11 ms			

Table 4.3.2.17: Shock Test Results, Page 3

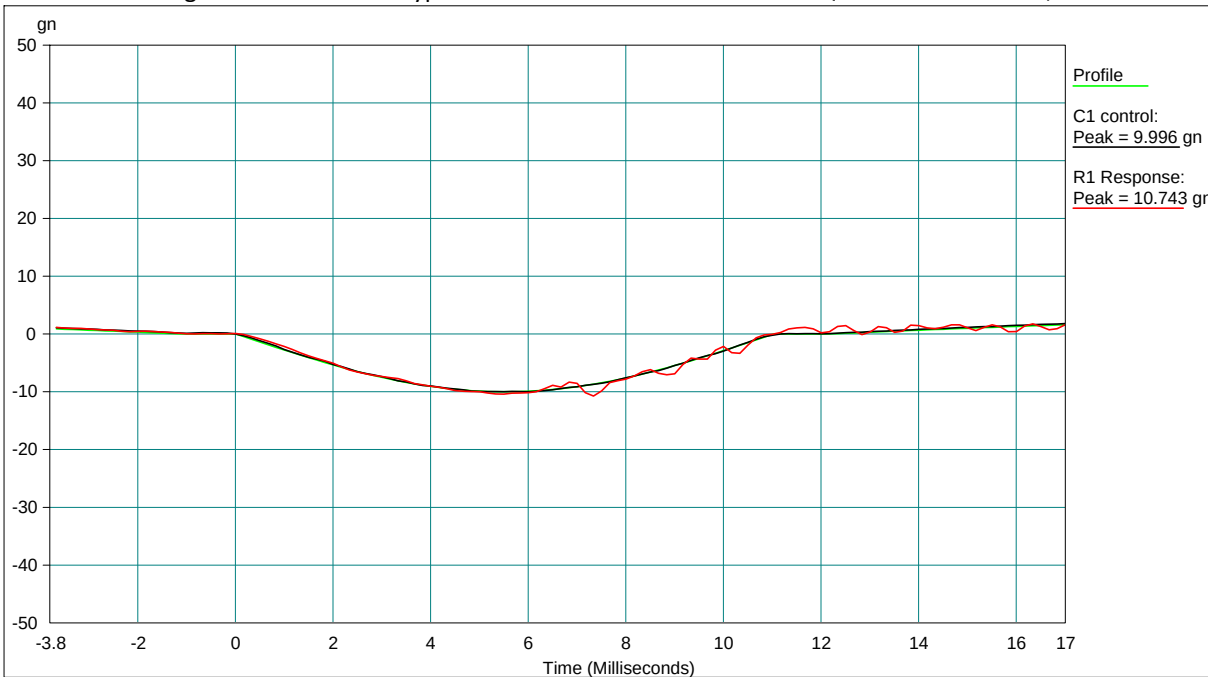
Professional Testing, EMI, Inc.			
In Accordance With:		Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 and ISO 13628-6	
Test Method:	Shock	Section:	Section 5.4.6
Test Date:	11/20/2012	EUT Serial #:	SN 7065
Customer:	Tideland Signal Corporation	EUT Part #:	E_NAVCON
Project Number:	13862-30	Test Technician:	John Crawford
Purchase Order #:	116585	Supervisor:	Yuki Fukuda
Equip. Under Test:	E-Navcon		
Shock Test Results			Page 3 of 7
- X axis Op Shock 10g 11ms PN E-NAVCON SN 7065 Project File Name: ISO 13628-6 Shock Half Sine 10G 11ms.prj Profile Name: 10gn 11mSec Test Type: Classical Shock Run Folder: \Run Default Nov 20,2012 13-53-13			
			
Level: 100 % Block Size: 1024 Elapsed Pulses: 10 Frame Time: 0.170667 Seconds Control Peak: 9.996268 gn Control RMS: 2.025826 gn Full Level Elapsed Pulses: 4 dT: 0.000167 Seconds Demand Peak: 10.000000 gn Demand RMS: 2.006089 gn Remaining Pulses: 0 Pulse Type: Half Sine Amplitude: 10.000000 gn Data saved at 01:54:18 PM, Tuesday, November 20, 2012 Report created at 01:54:19 PM, Tuesday, November 20, 2012			
- X Axis, Shock Test, 10 G, 11 ms			

Table 4.3.2.18: Shock Test Results, Page 4

Professional Testing, EMI, Inc.			
In Accordance With:	Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 and ISO 13628-6		
Test Method:	Shock	Section:	Section 5.4.6
Test Date:	11/20/2012	EUT Serial #:	SN 7065
Customer:	Tideland Signal Corporation	EUT Part #:	E_NAVCON
Project Number:	13862-30	Test Technician:	John Crawford
Purchase Order #:	116585	Supervisor:	Yuki Fukuda
Equip. Under Test:	E-Navcon		

Shock Test Results

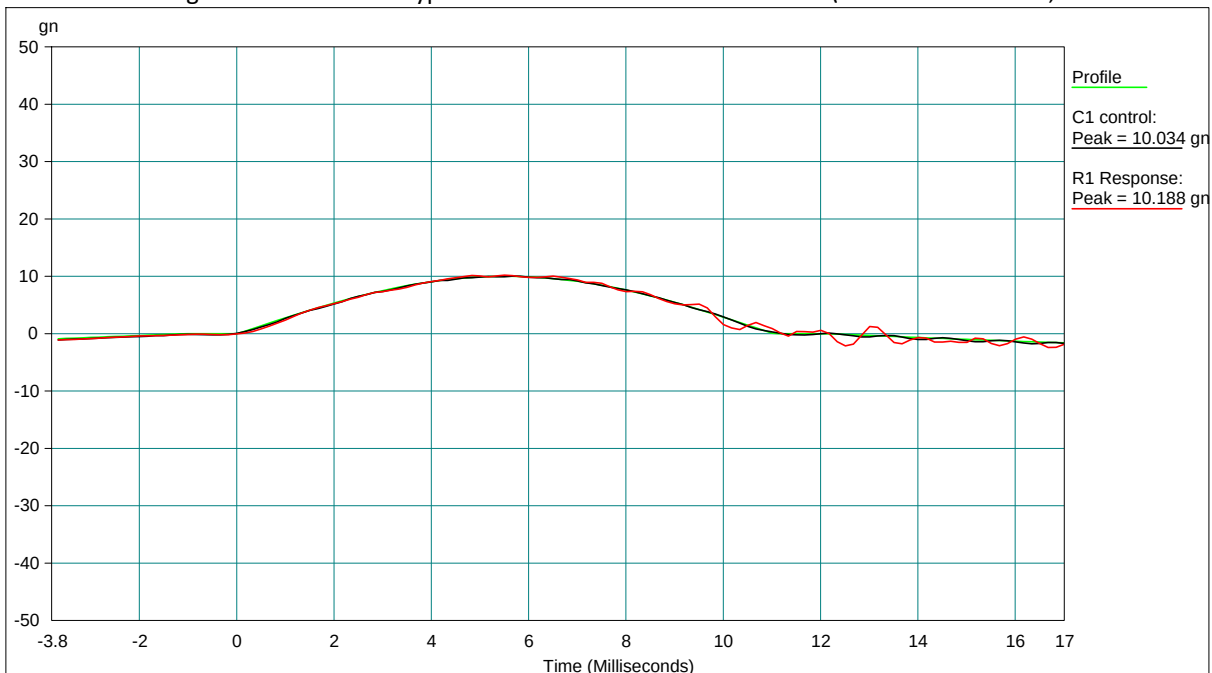
Page 4 of 7

+ Y axis Op Shock 10g 11ms

PN E-NAVCON SN 7065

Project File Name: ISO 13628-6 Shock Half Sine 10G 11ms.prj

Profile Name: 10gn 11mSec Test Type: Classical Shock Run Folder: \Run Default Nov 20, 2012 14-26-53



Level: 100 %

Block Size: 1024

Elapsed Pulses: 10

Frame Time: 0.170667 Seconds Control Peak: 10.034266 gn

Control RMS: 2.024210 gn

Full Level Elapsed Pulses: 4 dT: 0.000167 Seconds

Demand Peak: 10.000000 gn

Demand RMS: 2.006089 gn Remaining Pulses: 0

Pulse Type: Half Sine

Amplitude: 10.000000 gn

Data saved at 02:27:41 PM, Tuesday, November 20, 2012

Report created at 02:27:43 PM, Tuesday, November 20, 2012

+ Y Axis, Shock Test, 10 G, 11 ms

Table 4.3.2.19: Shock Test Results, Page 5

Professional Testing, EMI, Inc.			
In Accordance With:		Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 and ISO 13628-6	
Test Method:	Shock	Section:	Section 5.4.6
Test Date:	11/20/2012	EUT Serial #:	SN 7065
Customer:	Tideland Signal Corporation	EUT Part #:	E_NAVCON
Project Number:	13862-30	Test Technician:	John Crawford
Purchase Order #:	116585	Supervisor:	Yuki Fukuda
Equip. Under Test:	E-Navcon		

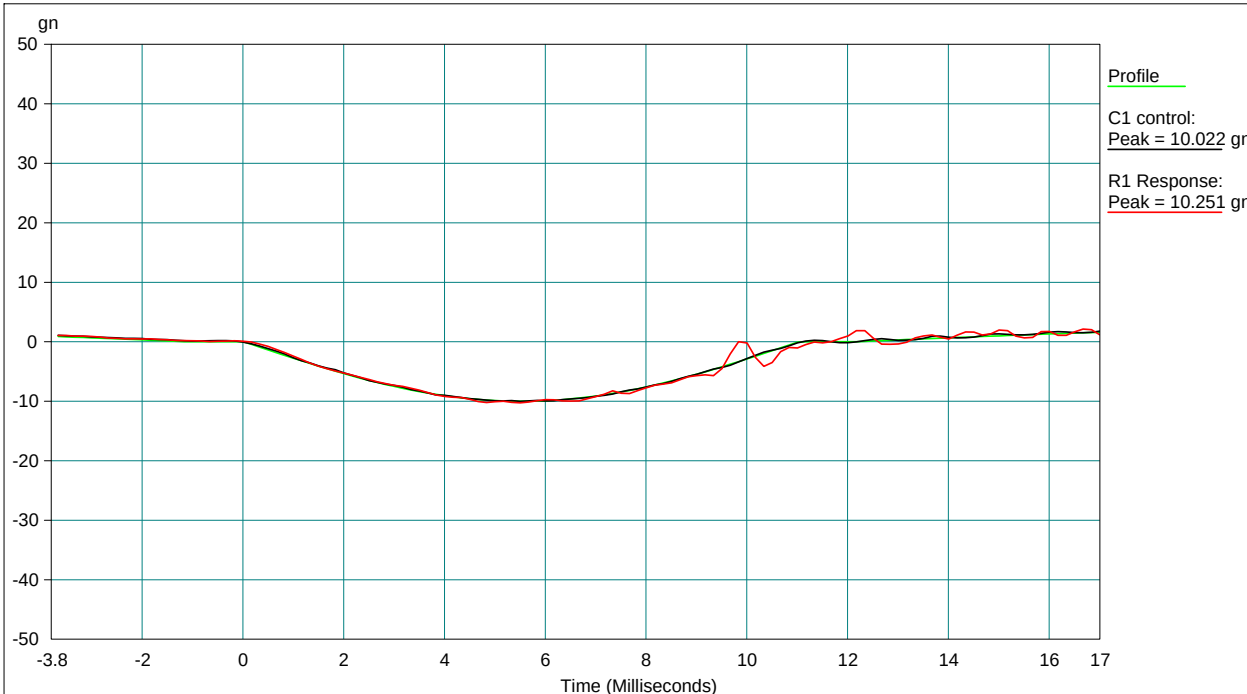
Shock Test Results		Page 5 of 7
- Y axis Op Shock 10g 11ms PN E-NAVCON SN 7065		
Project File Name: ISO 13628-6 Shock Half Sine 10G 11ms.prj		
Profile Name: 10gn 11mSec Test Type: Classical Shock Run Folder: \Run Default Nov 20, 2012 14-28-13		
		
Level: 100 % Block Size: 1024 Elapsed Pulses: 10		
Frame Time: 0.170667 Seconds Control Peak: 10.022056 gn Control RMS: 2.025358 gn		
Full Level Elapsed Pulses: 4 dT: 0.000167 Seconds Demand Peak: 10.000000 gn		
Demand RMS: 2.006089 gn Remaining Pulses: 0 Pulse Type: Half Sine		
Amplitude: 10.000000 gn		
Data saved at 02:28:57 PM, Tuesday, November 20, 2012		
Report created at 02:28:59 PM, Tuesday, November 20, 2012		
- Y Axis, Shock Test, 10 G, 11 ms		

Table 4.3.2.20: Shock Test Results, Page 6

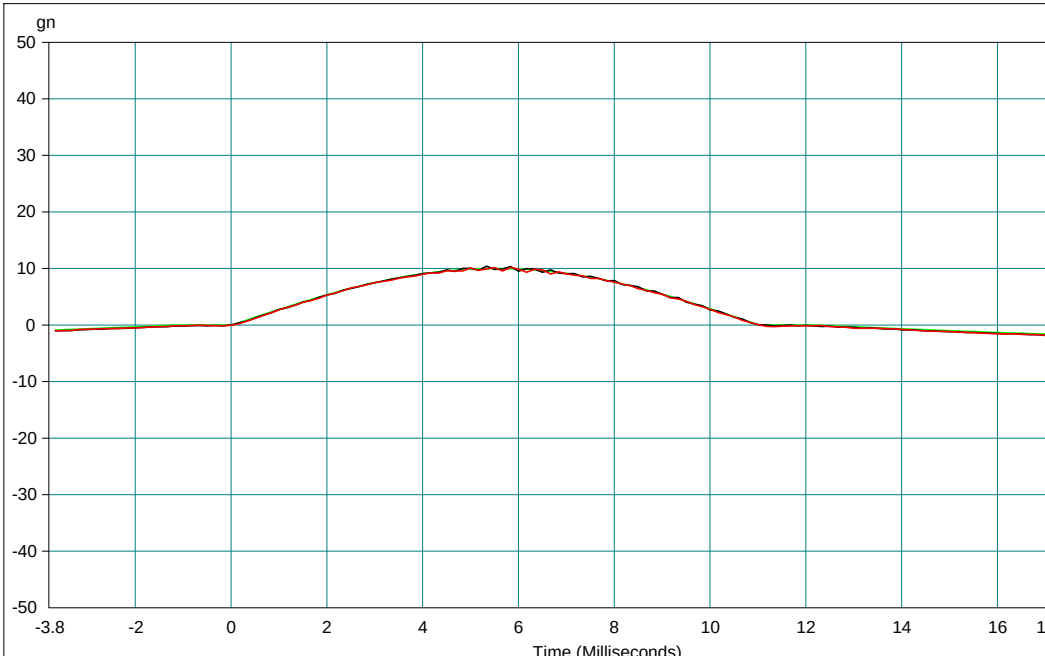
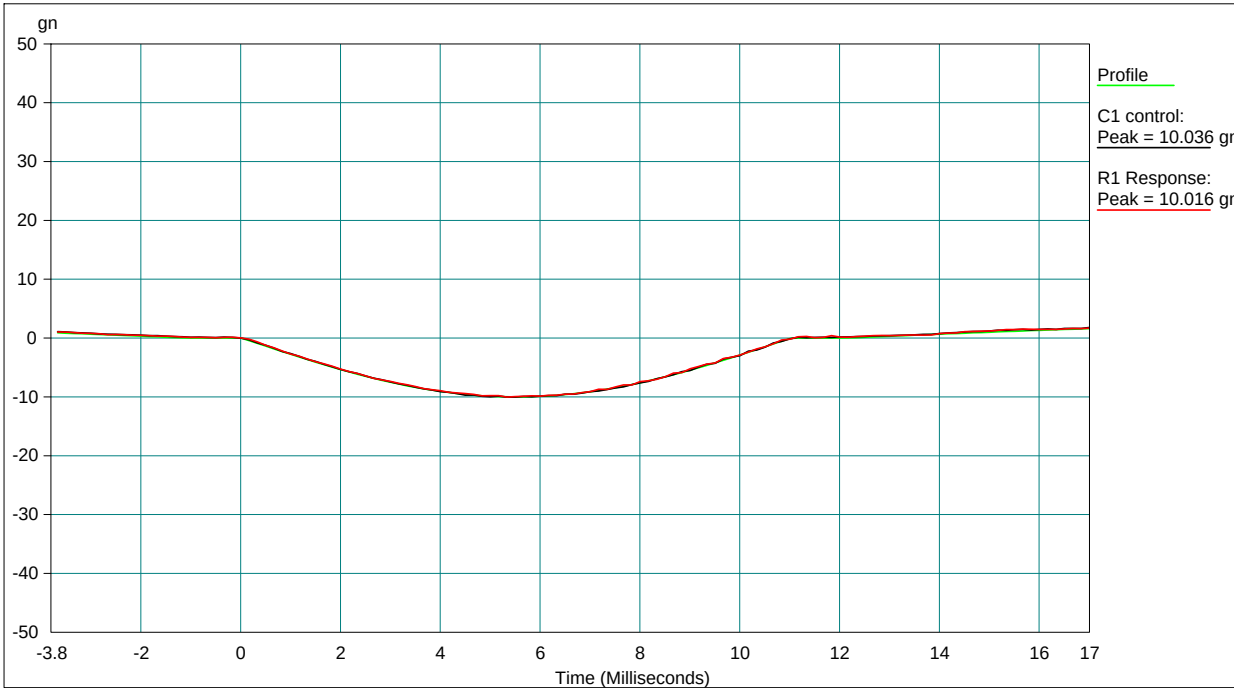
Professional Testing, EMI, Inc.			
In Accordance With:		Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 and ISO 13628-6	
Test Method:	Shock	Section:	Section 5.4.6
Test Date:	11/20/2012	EUT Serial #:	SN 7065
Customer:	Tideland Signal Corporation	EUT Part #:	E_NAVCON
Project Number:	13862-30	Test Technician:	John Crawford
Purchase Order #:	116585	Supervisor:	Yuki Fukuda
Equip. Under Test:	E-Navcon		
Shock Test Results			Page 6 of 7
+ Z axis Op Shock 10g 11ms PN E-NAVCON SN 7065			
Project File Name: ISO 13628-6 Shock Half Sine 10G 11ms.prj			
Profile Name: 10gn 11mSec Test Type: Classical Shock Run Folder: \Run Default Nov 20, 2012 15-18-01			
gn  Time (Milliseconds) Profile C1 control: Peak = 10.392 gn R1 Response: Peak = 10.162 gn			
Level: 100 % Block Size: 1024 Elapsed Pulses: 10			
Frame Time: 0.170667 Seconds Control Peak: 10.391979 gn Control RMS: 2.029878 gn			
Full Level Elapsed Pulses: 4 dT: 0.000167 Seconds Demand Peak: 10.000000 gn			
Demand RMS: 2.006089 gn Remaining Pulses: 0 Pulse Type: Half Sine			
Amplitude: 10.000000 gn			
Data saved at 03:18:53 PM, Tuesday, November 20, 2012			
Report created at 03:18:56 PM, Tuesday, November 20, 2012			
+ Z Axis, Shock Test, 10 G, 11 ms			

Table 4.3.2.21: Shock Test Results, Page 7

Professional Testing, EMI, Inc.			
In Accordance With:		Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 and ISO 13628-6	
Test Method:	Shock	Section:	Section 5.4.6
Test Date:	11/20/2012	EUT Serial #:	SN 7065
Customer:	Tideland Signal Corporation	EUT Part #:	E_NAVCON
Project Number:	13862-30	Test Technician:	John Crawford
Purchase Order #:	116585	Supervisor:	Yuki Fukuda
Equip. Under Test:	E-Navcon		

Shock Test Results		Page 7 of 7
- Z axis Op Shock 10g 11ms PN E-NAVCON SN 7065 Project File Name: ISO 13628-6 Shock Half Sine 10G 11ms.prj Profile Name: 10gn 11mSec Test Type: Classical Shock Run Folder: \Run Default Nov 20, 2012 15-19-29		
		Profile C1 control: Peak = 10.036 gn R1 Response: Peak = 10.016 gn
Level: 100 % Block Size: 1024 Elapsed Pulses: 10 Frame Time: 0.170667 Seconds Control Peak: 10.036228 gn Control RMS: 2.028631 gn Full Level Elapsed Pulses: 4 dT: 0.000167 Seconds Demand Peak: 10.000000 gn Demand RMS: 2.006089 gn Remaining Pulses: 0 Pulse Type: Half Sine Amplitude: 10.000000 gn Data saved at 03:20:13 PM, Tuesday, November 20, 2012 Report created at 03:20:14 PM, Tuesday, November 20, 2012		
- Z Axis, Shock Test, 10 G, 11 ms		

End of Report

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