

1601 North A.W. Grimes Blvd., Suite B Round Rock, TX 78665

e-mail: info@ptitest.com

(512) 244-3371 Fax: (512) 244-1846

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

Table of Contents

Title Page		1
_	ary	
	oduction	
1.1 Se	cope	5
	UT Description	
1.3 E	UT Operation	5
	Nodifications to Equipment	
2.0 App	olicable Documents	6
3.0 Env	ironmental Testing Preparation and Setup	7
	ntal Testing Preparation and Setup	
	est Site	
3.2	Measurement Accuracy	7
3.3	Test Instrumentation	
3.3.1	Equipment Nomenclature	7
4.0 Env	ironmental Tests	8
4.1 D	Pry Heat Test	8
4.1.1	Test Procedures	8
4.1.2	Test Results	8
4.2 D	Pamp Heat and Low Temperature Tests	13
4.2.1	Test Procedures	13
4.2.2	Test Results	13
4.3 V	ibration and Shock Tests	19
4.3.1	Test Procedures	19
4.3.2	Test Results	19
End of Rep	ort	40

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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	IEC 60945, Sec 8.2.2	+70° C up to 16 hrs	11/12/2012 to	Pass
(Storage)	IEC 60068-2-2	170 Cup to 101113	11/14/2012	1 433
Dry Heat	IEC 60945, Sec 8.2.1	+55° C up to 16 hrs	11/12/2012 to	Pass
(Operational)	IEC 60068-2-2	155 Cup to 101113	11/14/2012	r ass
Damp Heat	IEC 60945, Sec 8.3	+40° C / 93% RH	11/17/2012 to	Pass
Damp neat	IEC 60068-2-30	1 cycle = 24 hrs	11/18/2012	F 033
Low Temperature	IEC 60945, Sec 8.4.2	-25° C up to 24 hrs	11/16/2012 to	Pass
(Operational)	IEC 60068-2-1	-25 Cup to 24 III3	11/17/2012	F a 3 3
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:

L	Manufacturer	Model	Serial #	Part #	Description
EUT	Tideland Signal Corporation	E-Navcon	7065	E_NAVCON	Navigational Aid
Remote Equipment	Tideland Signal Corporation	Junction Box	No	one	Junction Box
Remote Equipmer	Dell	Latitude C610 Notebook	CN-0X076-48	643-64C-5563	Notebook to Monitor EUT Functions
	Quantity	Length	Shielded or	Unshielded?	Description
Cables	1	20 feet	Shie	lded	Serial Port from Cable to Computer
0	1	15 feet	Shie	lded	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 $+70^{\circ}$ C \pm 3° 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 $+55^{\circ}$ C \pm 3° 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

Table 4.	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 - 11/14/20)12	EUT Serial #:	SN 7065								
Custome	r:	Tideland Signal C	orporation	EUT Part #:	E_NAVC	ON							
Project N	umber:	13862-30		Test Technician: Dan Willemin									
Purchase	Order #:	116585		Supervisor:	Yuki Fuk	uda							
Equip. Ur	nder Test:	E-Navcon		•									
		Dry Hea	t Test Equipment List			Page 1 of 1							
Asset #	Manufactur	er Model	Equipment Nom	enclature	Serial #	Calibration Due Date							
0525	Tenney	T40RS	Chamber, Temp. 8	& Humidity	12334	11/09/2013							
0360	Fluke	2625A	Hydra Data L	.ogger	5788600	9/06/2013							
1544	Astron	RS-12A	ly, DC	91041363	NCR*								
NA	IBM	Thinkpad	Laptop		32P4414	NCR*							

^{*}NCR = No calibration required

Table 4.1.2.2: Dry Heat Test Results, Page 1

Table 4.1.2.2: Dry i	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	<u>I</u>		Page 1 of 3							
Dry Heat (Storage) Tes	t										
+70° C ± 3° C, for a per	iod of 10 h to 16 h.		Pass								
At the end of the test,	the EUT shall be returned to normal e	nvironmental	Pass								
conditions and then su	bjected to a performance check										
Dry Heat (Operational) Test										
+55 °C ± 3 °C, for a per	iod of 10 h to 16 h. EUT operational d	uring test	Pass								
At the end of the test,	the EUT shall be returned to normal e	nvironmental	rd55								
conditions and then su	bjected to a performance check										

Table 4.1.2.3: Dry	Heat Temperature Test Results	, Page 2	
	Professional To	esting, EMI, Ind	c.
In Accordance With:	Tideland Signal Test Plan for E-Nav IEC 60945 and IEC 60068-2-2	con, Rev 0.3, Dated on 6/	4/12 and
Test Method:	Dry Heat		
Test Date:	11/12 – 11/13/2012	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 Res	ults	Page 2 of 3
50 50 50 40 10 0			
11/12/2012 16:38 11/12/2012 16:11		11/13/2012 0:59 11/13/2012 1:32 11/13/2012 2:38 11/13/2012 3:45 11/13/2012 4:18 11/13/2012 4:51 11/13/2012 4:51	11/13/2012 6:57 11/13/2012 6:30 11/13/2012 7:38 11/13/2012 8:09 11/13/2012 8:42 11/13/2012 8:42 11/13/2012 8:43 11/13/2012 8:48
	Dry Heat (Storage) To	emperature Test Chart	

Table 4	1.1.2.	4: D	'nΗ	eat	: Te	mp	era	atu	ıre	Te	est	Re	esu	ılt	s, F	a٤	зe	3																_		
						P	r	of	es	si	io	na	al	T	es	st	in	g	, I	E۱	ΛI	l,	In	C	•											
In Accor	dance	With	ı:		delai C 609									Na	vco	n,	Re	v 0	.3,	Da	te	d o	n 6	/4	/12	2 a	nd									
Test Me	thod:			Dry	у Не	at																														
Test Dat	te:			11,	/13	- 11	1/1	4/2	012	2							E	UT	Se	eria	ıl #	:			S	N:	706	55								
Custome	er:			Tid	ideland Signal Corporation EUT Part #: E_NAVCON																															
Project I	Numb	er:		138	862	-30											1	es	t T	ech	nic	ciaı	ո։		[an	W	/ille	em	in						
Purchase	e Orde	er #:		110	658	5											S	up	erv	viso	or:				Υ	'uk	i F	ukı	uda)						
Equip. U	Inder ⁻	Test:		E-N	Navo	on																														
					Dry	y He	at 1	Гen	npe	rat	ture	e To	est	Re	sul	ts											•						Pa	ge	3 c	of 3
Temperature C	50 - 40 - 30 - 20 - 10 -	11/13/2012 11:40	11/13/201212:48	11/13/201213:19	11/13/2012 13:52	11/13/201214:58	11/13/201216:31	11/13/201216:04	11/13/2012 16:37	11//3/201217:10	11/13/2012/17/43	11/13/201218:16	11/13/2012 18:49	11/13/201218/22	= ;	-	3 11/13/2012 21:02	=	11/13/2012/22:08	11/13/2012/22:41	11/13/2012 23:14	11/13/2012 23:47	11/14/2012 0:20	11/14/2012 0:53	11/14/2012128	11/14/20121:59	11/14/2012 2:32	11/14/2012 3:05	11/14/20123:38	11/14/20124:11	11/14/2012 4:44	11/14/2012 5:17	11/14/2012 6:50	11/14/2012623	11/14/2012 6:56	
							D	rv I	Hea	t ((One	ra	tio	na	I) T	-m	ne	rat	ure	ъ Т	est	Ch	art													
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Functional Test Setup

EUT in Thermal Chamber

Table 4.1.2.5: Dry I	Heat Temperature Test Photographs	<u> </u>	-
	Professional Testi	ng, EMI, Inc	``.
In Accordance With:	Tideland Signal Test Plan for E-Navcon, F IEC 60945 and IEC 60068-2-2	Rev 0.3, Dated on 6/4	4/12 and
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 Photograph	S	Page 1 of 1

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 $+40^{\circ}$ C \pm 2° C and 93% \pm 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.

For the low temperature test, the EUT was subjected to a temperature of -25° C \pm 3° 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

Table 4	Table 4.2.2.1. Damp Heat and Cold Test Equipment											
	Professional Testing, EMI, Inc.											
In Accord	In Accordance With: Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 IEC 60945, IEC 60968-2-30, and IEC 60068-2-1											
Test Met	Test Method: Damp Heat and Cold											
Test Date	e:	11/16 – 11/18/2	012	EUT Serial #:	SN 7065							
Custome	r:	Fideland Signal C	Corporation	EUT Part #:	E_NAVC	ON						
Project Number: 13862-30 Test Technician: Dan Willemin												
Purchase	Order #:	116585		Supervisor:	Yuki Fuk	uda						
Equip. Ur	nder Test:	E-Navcon										
		Damp Heat ar	nd Cold Test Equipmen	t List		Page 1 of 1						
Asset #	Manufacture	r Model	Equipment Nom	enclature	Serial #	Calibration Due Date						
0983	Envirotronics	N/A	Chamber, Envir	onmental	None	2/07/2013						
0360	Fluke	2625A	Hydra Data I	-ogger	5788600	9/06/2013						
1544 Astron RS-12A Power Supply, DC 91041363 NCR												
NA	IBM	Thinkpad	Laptop)	32P4414	NCR*						

^{*}NCR = No calibration required

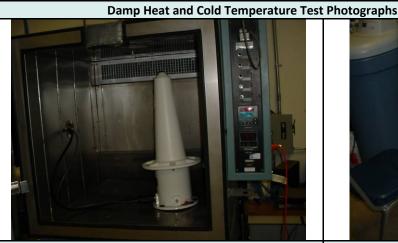
Table 4.2.2.2: Damp Heat Test Results, Page 1

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		<u>.</u>	Page 1 of 2								
conditions were maint powered on and opera chamber temperature	was raised to $+40^{\circ}$ C \pm 2° C and $93\% \pm 3\%$ rained at 40° C/93% RH for 10 to 16 hosted for at least 2 hours. At the end of the was ramped-down to room temperature the test, the EUT was returned to nor	urs. The EUT was the test period, the re in not less than	Pass									

Table 4.2.2.	3։ Damլ	Heat Test Results	, Page 2			
		Profess	sional Test	ting, EMI, II	nc.	
In Accordance	With:	Tideland Signal Test IEC 60945 and IEC 60		, Rev 0.3, Dated on	6/4/12	
Test Method:		Damp Heat				
Test Date:		11/17 – 11/18/2012		EUT Serial #:	SN 7065	
Customer:		Tideland Signal Corp	oration	EUT Part #:	E_NAVCON	
Project Numb	er:	13862-30		Test Technician:	Dan Willemin	
Purchase Orde	er #:	116585		Supervisor:	Yuki Fukuda	
Equip. Under	Test:	E-Navcon				
		Damp Heat	Test Results		<u> </u>	Page 2 of 2
				gnal, 13862-30 Fest, E-Navcon		
100	_	Te	emperature	—— Humidity		
20 So 70 So	1/17/12/13:06 1/17/12/18:06 1/17/12/18:42	M7M218:54 M7M220:30 M7M221:06 M7M222:42 M7M222:54 M7M223:30	78/12/05/25 78/12/01/18 78/12/02/30 78/12/03/06 78/12/03/42	// 8/12 04:18 // 8/12 04:54 // 8/12 06:30 // 8/12 06:42 // 8/12 07:18	787208:30 1787209:06 1787210:18 1787210:54 1787211:30 1787212:06 1787212:42	1/18/12:13:54 1/18/12:14:30
			Ds	te/time		111
		Da	mp Heat Tempera	ture Test Chart		

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

		<u> </u>							
	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 6006	8-2-1							
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								





Page 1 of 1

Functional Test Setup

Table 4.2.2.5: Cold Test Results, Page 1

Table 4.2.2.5. Cold Test Results, Page 1									
Professional Testing, EMI, Inc.									
In Accordance With:	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	E_NAVCON							
Project Number:	13862-30	Test Technician:	Dan Willemin						
Purchase Order #:	116585	Supervisor:	Yuki Fukuda						
Equip. Under Test:	E-Navcon								
	Cold Test Results								
Cold Test -25° C ± 3° C for up to	Pass								

est Method: Cold est Date: 11/16 – 11/17/2012 EUT Serial #: SN 7065 ustomer: Tideland Signal Corporation EUT Part #: E_NAVCON roject Number: 13862-30 Test Technician: Dan Willemin urchase Order #: 116585 Supervisor: Yuki Fukuda	Table 4.2.2.6: Cold	Test Results, Page 2		
Accordance With: IEC 60945 and IEC 60068-2-1		Professional Tes	ting, EMI, Ind	C .
est Date: 11/16 – 11/17/2012 EUT Serial #: SN 7065 ustomer: Tideland Signal Corporation EUT Part #: E_NAVCON roject Number: 13862-30 Test Technician: Dan Willemin urchase Order #: 116585 Supervisor: Yuki Fukuda quip. Under Test: E-Navcon Cold Test Results Page 2 of: Tileland Signal, 13862-30 Cold Test, E-Navcon —— Temperature 30 20 10 20 20 20 20 20 20 20 20 20 20 20 20 20	In Accordance With:		, Rev 0.3, Dated on 6/	4/12
Tideland Signal Corporation EUT Part #: E_NAVCON	Test Method:	Cold		
Tileland Signal, 13862-30 Cold Test Results Page 2 of Cold Test, E-Navcon Tileland Signal, 13862-30 Cold Test, E-Navcon Told Test, E-Navcon Tileland Signal, 13862-30 Cold Test, E-Navcon Temperature Told Test, E-Navcon Temperature Tender Test: Dan Willemin Page 2 of Tileland Signal, 13862-30 Cold Test, E-Navcon Temperature Temperat	Test Date:	11/16 – 11/17/2012	EUT Serial #:	SN 7065
Tileland Signal, 13862-30 Cold Test, E-Navcon Cold Test, E-Navcon Tileland Signal, 13862-30 Cold Test, E-Navcon — Temperature 10 10 10 10 10 10 10 10 10 10 10 10 10	Customer:	Tideland Signal Corporation	EUT Part #:	E_NAVCON
Cold Test Results Page 2 of Tileland Signal, 13862-30 Cold Test, E-Navcon — Temperature 20 20 20 20 20 20 20 20 20 20 20 20 20	Project Number:	13862-30	Test Technician:	Dan Willemin
Cold Test Results Page 2 of Tileland Signal, 13862-30 Cold Test, E-Navcon — Temperature Temp	Purchase Order #:	116585	Supervisor:	Yuki Fukuda
11/16/12/13/4 11	Equip. Under Test:	E-Navcon		
Cold Test, E-Navcou 1/4 8/12/11:54		Cold Test Results		Page 2 of 2
11/16/12/154 11/16/12/12/44 11/16/12/12/44 11/16/12/12/44 11/16/12/12/44 11/16/12/12/44 11/16/12/12/44 11/16/12/12/46 11/16/12/12/12/12/12/12/12/12/12/12/12/12/12/	20	Тетр	retature	
11/16/11:54 11/16/12:14 11/16/12:12:44 11/16/12:12:44 11/16/12:12:44 11/16/12:12:13:14 11/16/12:12:13:16 11/16/12:13:16	-20			
11/16/11:54 11/16/12:14 11/16/12:12:44 11/16/12:12:44 11/16/12:12:44 11/16/12:12:13:14 11/16/12:12:13:16 11/16/12:13:16				
				11/7/12/06:35 11/7/12/10:25 11/7/12/12:05 11/7/12/12:05 11/7/12/13:45 11/7/12/16:15 11/7/12/16:15

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

Table 4	.S.Z.I. VIDIALI	on and Shock	rest Equipment			
		Profe	essional Test	ing, EMI	, Inc.	
In Accord	iance With:	ideland Signal To SO 13628-6	est Plan for E-Navcon,	Rev 0.3, Dated	on 6/4/12 and	
Test Met	hod: \	ibration and Sho	ock	Section:	Section	on 5.4.6
Test Date	e: 1	1/20 and 11/21/	2012	EUT Serial #:	SN 70	65
Custome	r: 1	ideland Signal Co	orporation	EUT Part #:	E_NA	VCON
Project N	lumber: 1	3862-30		Test Technic	ian: John	Crawford
Purchase	Order #: 1	16585		Supervisor:	Yuki F	ukuda
Equip. Uı	nder Test: E	-Navcon				
		Vibration and S	hock Test Equipment L	ist		Page 1 of 1
Asset #	Manufacturer	Model	Equipment Nome	enclature	Serial #	Calibration Due Date
1533	Dactron	V2.10	Shaker Contr	oller	7221624	12/20/2012
1070	Dactron	V2.0	PCI DSP Ca	rd	3410179	N/A
1534	Ling	DMA4016E	Power Am	ıp	035	N/A
1535	Ling	335VH	Shaker Tak	ole	154	N/A
1556	Endevco	133	133 Signal Conditioner		AF49	06/19/2013
2035	Dytran	3055B1G	Accelerome	ter	8952	10/12/2013
1618	Dytran	3055B1G	Accelerome	ter	3993	06/02/2013
2019	Dytran	3055B1G	Accelerome	ter	8732	06/07/2013

Table 4.3.2.2: Vibration and Shock Data Channel Designation

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, ISO 13628-6	Rev 0.3, Dated on 6/4,	/12 and							
Test Method:	Vibration and Shock	Section:	Section	n 5.4.6						
Test Date:	11/20 and 11/21/2012	11/20 and 11/21/2012 EUT Serial #: SN 700								
Customer:	Tideland Signal Corporation	EUT Part #:	E_NAV	CON .						
Project Number:	13862-30	John C	rawford							
Purchase Order #:	116585	Supervisor:	Yuki Fı	ukuda						
Equip. Under Test:	E-Navcon									
	Vibration Data Channel			Page 1 of 1						
Input Channel		Color								
Input 1 (8952)	C1 Control on end of slip table in X & Y	xis	Black							
Input 2 (3993)	C2 Control on fixture in Z axis only for F		Black							
Input 3 (8732)		Red								

Table 4.3.2.3: Vibration Test Results. Page 1

1 abic 4.3.2.3. Vibia	ation rest Results, Page 1				
	Professional Tes	ting, EN	11, Inc.		
In Accordance With:	Tideland Signal Test Plan for E-Navcoi ISO 13628-6	n, Rev 0.3, Dat	ted on 6/4/12 a	ind	
Test Method:	Vibration	Section:	Sec	tion 5.4.6	
Test Date:	11/20 and 11/21/2012	EUT Seria	#: SN	7065	
Customer:	Tideland Signal Corporation	EUT Part #	#: E_N	NAVCON	
Project Number:	13862-30	Test Tech	nician: Joh	n Crawford	
Purchase Order #:	116585	Superviso	r: Yul	ki Fukuda	
Equip. Under Test:	E-Navcon				
	Vibration Test Results			<u>.</u>	Page 1 of 8
			X Axis	Y Axis	Z Axis
Sine Sweep Vibration: octave rise, 25 Hz to 15 double sweep from 5 H all 3 axes.	inute. A Pass		Pass Run #3		
Random Vibration: 20 at 0.04 g ² /Hz, 350 Hz to Composite 6 Grms for 3	z to 350 Hz	Not Required	Not Required	Pass Run #4	

		essiona								
n Accordance With:	Tideland Signal [*] ISO 13628-6	lest Plan for	E-Navcon	, Kev U	.3, Da	tea o	n 6/4	/12 and		
est Method:	Vibration			Sec	tion:			Section	n 5.4.6	
est Date:	11/20 and 11/2			EUT	Seria	l #:		SN 706	5	
ustomer:	Tideland Signal	Tideland Signal Corporation EUT Part #:							CON	
roject Number:	13862-30				t Tech		1:		rawford	
urchase Order #:	116585			Sup	erviso	or:		Yuki Fu	ıkuda	
quip. Under Test:	E-Navcon									
	Vibrat	ion Test Resu	ults					-	Pa	ge 2 of
un # 1 X axis Sine Su	ırvey 5G O 13628-6 5G sine 5-		N E-NAVO	ON SN	7065			F	R1 marked sweep	up
•	urvey 5 to 150 Hz 1 o			Test: Sv	wept S	Sine	Ru	ın : \ Nov	20, 2012 13-57-4	2
gn	•	·			<u> </u>			·		
100.0000									profile(f)	
									R1 Response:	
			R1 Respo	nse: 150	0. 0000,	4. 262	5		Peak = 0.001 gn	
10.0000									control(f)	
					_					
1.0000		1	Si gnal R1 Respor	x se 133.	952 ^Y	59392				
0.1000										
								-		
0.0100 5.00	10.00	1					100.0	00 1	60.00	
			uency (Hz)	24 -			_			_
L 400.5′		Control Pea	к: 4.9967	s4 gn			Fu	ıll Level Ti	ime: 00:04:5	5
evel: 100 % weep Type: Logarith	nmic	Frequency:		78 Hz	De	man	Peal	k: 5.0000	00 gn	

X Axis, Run #1, Sine Sweep Up

Table 4.3.2.5: Vib	ration Test Results, Page 3						
	Professional ⁻	Testi	ng, El	ΜI,	lnc		
In Accordance With:	Tideland Signal Test Plan for E-N ISO 13628-6	lavcon, F	Rev 0.3, Da	ated o	า 6/4	/12 and	
Test Method:	Vibration		Section:			Section	5.4.6
Test Date:	11/20 and 11/21/2012		EUT Seria	al #:		SN 7065	5
Customer:	Tideland Signal Corporation	Tideland Signal Corporation EUT Part #:					
Project Number:	13862-30		Test Tecl	hniciar	ı:	John Cr	awford
Purchase Order #:	116585		Supervis	or:		Yuki Ful	kuda
Equip. Under Test:	E-Navcon						
	Vibration Test Results	l .				·	Page 3 of 8
=	rvey 5G PN E D 13628-6 5G sine 5-150Hz.prj rvey 5 to 150 Hz 1 oct/min 5G Test		N SN 7065 vept Sine	5	Ru		1 marked sweep down 20, 2012 13-57-42
gn 100.0000	,		<u> </u>				,
1.0000			xe: 150.0000		2		profile(f) R1 Response: Peak = 0.101 gn control(f)
Data saved at 02:08:3	Control Peak: 0 mic Frequency: 5.00 00:00:01 Sweep Rate: 1 0 66 PM, Tuesday, November 20, 2012 08:37 PM, Tuesday, November 20, 2	.101278 02398 H Oct/Min	z			ıll Level Tir	me: 00:09:49 ak: 0.100642 gn

X Axis, Run #1, Sine Sweep Down

Table 4.3.2.6:	Vibra	tion Test Re	esults,	Page 4										
		Pr	ofes	siona	l Te	stir	ng,	ΕN	II, I	lnc	•			
In Accordance W	/ith:	Tideland Sign ISO 13628-6	nal Test	Plan for	E-Navc	on, Re	ev 0.3	, Dat	ed o	า 6/4	/12 and			
Test Method:		Vibration					Sectio	n:			Section	n 5.4	1.6	
Test Date:		11/20 and 11/21/2012 EUT Serial #: SN 7065												
Customer:		Tideland Sign	deland Signal Corporation EUT Part #: E_I							E_NA	VCON	N		
Project Number	:	13862-30	13862-30 Test Technician:						ı:	John (Craw	ford		
Purchase Order	#:	116585					Super	visor	:		Yuki F	ukuc	la	
Equip. Under Te	st:	E-Navcon												
		Vil	bration ⁻	Test Resu	ılts						•		P	age 4 of 8
Run # 2 Y axis Sir Project File Nam Profile Name: Sir	e: ISO 1	3628-6 5G sin	e 5-150		ON SN 7		t: Swe	ept Si	ne	Ru			narked swee 2012 14-29	
100.0000 100.0000 1.0000				1	R1 Si gnal R1 Res		x X X 108.25			193	\$ The state of t	R	rofile(f) 1 Response: eak = 0.002 gn ontrol(f)	
0.0100 5.00 Level: 100 % Sweep Type: Log Time Remaining: Data saved at 02 Report created a	: 00 ::35:22 I	:04:54 PM, Tuesday,	Fre Sw Novemb	ntrol Peal equency: : eep Rate per 20, 20	149.867 : 1 Oct/)12	5955 g 7661 l Min		Der	mano		0 Level		: 00:04	:55

Y Axis, Run #2, Sine Sweep Up

		Tideland Sign	ofessiona						
Test Date: 11/20 and 11/21/2012 EUT Serial #: SN 7065	n Accordance Wit	·h·							
Tideland Signal Corporation Project Number: 13862-30 Test Technician: John Crawford Supervisor: Yuki Fukuda Purchase Order #: 116585 Supervisor: Yuki Fukuda Page 5 c Run # 2 Y axis Sine Survey 5 G Run # 2 Y axis Sine Survey 5 G Run # 2 Y axis Sine Survey 5 to 150 Hz 1 oct/min 5G Test Type: Swept Sine Run : \ Nov 20, 2012 14-29-42 Profile Name: Sine Survey 5 to 150 Hz 1 oct/min 5G R1 Response: 150,0000, 5, 1551 R1 Response: 150,0000, 5, 1551 R2 Response: 150,0000, 5, 1551 R3 Response: 150,0000, 5, 1551 R4 Response: 150,0000, 5, 1551 R5 R	est Method:								
Project Number: 13862-30 Purchase Order #: 116585 Supervisor: Yuki Fukuda Equip. Under Test: E-Navcon Vibration Test Results									
Purchase Order #: 116585 Supervisor: Yuki Fukuda			nal Corporation						
Vibration Test Results Page 5 or							n:		
Vibration Test Results					Supervi	isor:		Yuki Ful	kuda
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 profile Name: Sine Survey 5 to 150 Hz 1 oct/min 5G Test Type: Swept Sine Run:\Nov 20, 2012 14-29-42 profile(f) R1 Response: 150, 0000, 5, 1551 profile(f) R1 Response: 150, 0000, 5, 1551 profile(f) R1 Response: 140, 0000, 5, 1551 profile(f) R1 Response: 140, 0000, 5, 1551 profile(f) R1 Response: 150, 0000, 5, 1551 profile(quip. Under Test	: E-Navcon		1					
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 14-29-42 100.0000 R1 Response: 150.0000, 5.1551 R1 Response: Peak = 0.101 gn control(f) 1.0000 Frequency (Hz) Evel: 100 % Control Peak: 0.101365 gn Sweep Type: Logarithmic Frequency: 5.001781 Hz Frequency: 5.001781 Hz Demand Peak: 0.100642 gn Sweep Rate: 1 Oct/Min		Vil	oration Test Res	ults				•	
Profile Name: Sine Survey 5 to 150 Hz 1 oct/min 5G Test Type: Swept Sine Run : \ Nov 20, 2012 14-29-42 100,0000		•		N E-NAVCC	ON SN 706	55		R:	1 marked sweep dowi
10.0000 10.00000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.00000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.00000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.00000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.00000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.00000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.00000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.00000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.00000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.00000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.00000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.00000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.00000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.00000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.00000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.00000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.00000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.00000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.00000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.00000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.00000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.00000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.00000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000 10.0000	-		• •	est Type: S	wept Sine	2	Rur	า : \ Nov 2	20. 2012 14-29-42
10.0000 1.00000 1.00	an			7,000				(1101	
10.0000 11.0000 100.000 100	100.0000								profile(f)
10.0000 10.00000 10.00000 10.00000 10.00000 10.000000 10.0000000 10.00000000									
1.0000 1.00000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.00000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.00000 1.00000 1.00000 1.00000 1.00000 1.00000 1.00000 1.000000 1.000000 1.00000000				R1 Res	ponse: 150	0.0000, 5	. 1551		
1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.00000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.00000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.00000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.00000 1.00000 1.00000 1.00000 1.00000 1.00000 1.00000 1.000000 1.000000 1.00000000									control(f)
0.1000	10.0000								
0.1000									•
0.1000									
0.1000									
0.1000	1.0000			Signal	X	Y			
0.0100				-1 R1 Respon	se 134.847	5. 5204	7		
0.0100									
0.0100									
5.00 10.00 100.00 100.00 160.00 Evel: 100 % Control Peak: 0.101365 gn Full Level Time: 00:09:49 Sweep Type: Logarithmic Frequency: 5.001781 Hz Demand Peak: 0.100642 gn Fime Remaining: 00:00:01 Sweep Rate: 1 Oct/Min	0.1000								
5.00 10.00 100.00 100.00 160.00 Evel: 100 % Control Peak: 0.101365 gn Full Level Time: 00:09:49 Sweep Type: Logarithmic Frequency: 5.001781 Hz Demand Peak: 0.100642 gn Fime Remaining: 00:00:01 Sweep Rate: 1 Oct/Min									
5.00 10.00 100.00 100.00 160.00 Evel: 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									
5.00 10.00 100.00 100.00 160.00 Evel: 100 % Control Peak: 0.101365 gn Full Level Time: 00:09:49 Sweep Type: Logarithmic Frequency: 5.001781 Hz Demand Peak: 0.100642 gn Fime Remaining: 00:00:01 Sweep Rate: 1 Oct/Min									
5.00 10.00 100.00 100.00 160.00 Erequency (Hz) 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									
Frequency (Hz) 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 Fime Remaining: 00:00:01 Sweep Rate: 1 Oct/Min		10.00	1			<u> </u>	100.	.00	160.00
weep Type: Logarithmic Frequency: 5.001781 Hz Demand Peak: 0.100642 gn Time Remaining: 00:00:01 Sweep Rate: 1 Oct/Min			Fre	equency (Hz)					
Fime Remaining: 00:00:01 Sweep Rate: 1 Oct/Min	evel: 100 %		Control Pea	k: 0.101365	5 gn		Full	l Level Tir	ne: 00:09:49
· · · · · · · · · · · · · · · · · · ·	weep Type: Logar	rithmic	Frequency:	5.001781 H	lz		Der	mand Pea	ık: 0.100642 gn
	ime Remaining:	00:00:01	Sweep Rate	: 1 Oct/Mir	1				

Y Axis, Run #2, Sine Sweep Down

n Accordance With	Tideland Sign	ofessional T				
	ISO 13628-6		<u> </u>			
est Method:	Vibration	10.100.0	Sectio		Section	
est Date:	11/20 and 11		erial #:	SN 706		
Customer:		al Corporation	EUT P		E_NAV	
Project Number:		13862-30 Test Technician:				rawford
Purchase Order #:	116585		Super	visor:	Yuki Fu	kuda
Equip. Under Test:	E-Navcon					
		ration Test Results			•	Page 6
tun # 3 Z axis Sine S project File Name: IS profile Name: Sine S	SO 13628-6 5G sine		PN E-NAV Test: Swe			R1 sweep u 20, 2012 15-20-44
gn 100.0000						
						profile(f)
						R1 Response: Peak = 0.002 gn
10.0000						control(f)
1.0000						
0.1000						
0.1000						
0.0100 5.00	10.00				100.00	160.00
0.00	10.00	Frequenc	y (Hz)		100.00	1.00.00
evel: 100 % Sweep Type: Logarit Time Remaining:	hmic 00:04:54	Control Peak: 5.0 Frequency: 149.9 Sweep Rate: 1 O	959915 Hz	Demand	Full Level Ti Peak: 5.0000	

Z Axis, Run #3, Sine Sweep Up

100.00

160.00

Table 4.3.2.9: Vibra	ation Test Results, Page 7		
	Professional Testi	ing, EMI, Inc	•
In Accordance With:	Tideland Signal Test Plan for E-Navcon, ISO 13628-6	Rev 0.3, Dated on 6/4	l/12 and
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 c
Run # 3 Z axis Sine Sur	rvey 5G PN E-NAVCC	N SN 7065	R1 sweep down
· · · · · · · · · · · · · · · · · · ·	13628-6 5G sine 5-150Hz.prj vey 5 to 150 Hz 1 oct/min 5G	Sine Run: \ Nov 20	0, 2012 15-20-44
100.0000 100.0000			profile(f) R1 Response: Peak = 0.099 gn C1 Control: Peak = 0.100 gn
1.0000			

Frequency (Hz) Level: 100 % Control Peak: 0.100167 gn Full Level Time: 00:09:49 Frequency: 5.001781 Hz Demand Peak: 0.100642 gn Sweep Type: Logarithmic

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

10.00

0.1000

0.0100 5.00

Z Axis, Run #3, Sine Sweep Down

			nal Test	<u> </u>			
n Accordance With	Tideland Sign : ISO 13628-6	al Test Plan	for E-Navcon	, Rev 0.3, Da	ated on	6/4/12 an	d
Test Method:	Vibration			Section:		Secti	on 5.4.6
Test Date:	11/20 and 11	/21/2012		EUT Seria	al #:	SN 70	065
Customer:	Tideland Sign	Tideland Signal Corporation			#:	E_NA	VCON
Project Number:	13862-30			Test Tech	nnician:	John	Crawford
Purchase Order #:	116585			Supervise	or:	Yuki	Fukuda
quip. Under Test:	E-Navcon						
	Vib	ration Test R	esults				Page
Run # 4 Z axis			VCON SN 706	55			End of 2 hours
Project File Name: I				_	\	24 2242	05.44.45
Profile Name: Rand	om 6.06 Grms 2 Hr	S	Test: Rando	om Ri	un: \ No	v 21, 2012	06-44-46
(gn) ² /Hz 15.0000 —							
							profile(f)
							high-alarm(f)
							low-alarm(f)
1.0000							R1 Response:
							PSDRms=8.451 gn
0.4000							control(f)
0.1000					. 1	, A	N.
		an man		MARKAN WALLEN	May .		//
0.0100						Total Andrews	
0.0100							
					Y		
0.0010							
0.0010							
							#
1.005004							
1. 000£04 10.00		100.00	Frequency (Hz)		10	000.00	2100.00
evel: 100 %			RMS: 6.09719	06 gn		Full Level	Elapsed Time: 02:00
ines: 1600			me: 0.800000	_	omand [

Report created at 08:46:14 AM, Wednesday, November 21, 2012

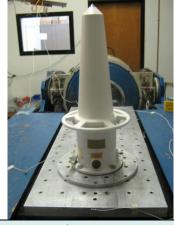
Z Axis, Run #4, Random Vibration

Table 4.3.2.11: Vibration and Shock Test Photographs. Page 1

Table 4.3.2.11: Vibration and Snock 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					
116585 Supervisor: Yuki Fukuda					
Equip. Under Test: E-Navcon					

Vibration and Shock Test Photographs

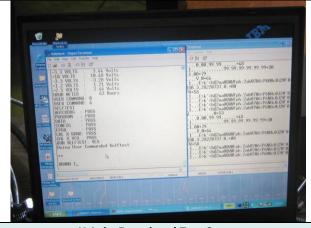
Page 1 of 4







X Axis, Functional Test Setup



X Axis, Functional Test Setup



C1 Control in X Axis

C1 Control in Y Axis

ration and Shock Test Photograp	ohs, Page 2	
Professional Te	sting, EMI, Inc	
Vibration and Shock	Section:	Section 5.4.6
11/20 and 11/21/2012	EUT Serial #:	SN 7065
Tideland Signal Corporation	EUT Part #:	E_NAVCON
13862-30	Test Technician:	John Crawford
116585	Supervisor:	Yuki Fukuda
E-Navcon		
Vibration and Shock Test Photogra	phs	Page 2 of 4
### 3 0 29 E* ### 3	YAX	is, Test Setup
	Professional Text Plan for E-Navco ISO 13628-6 Vibration and Shock 11/20 and 11/21/2012 Tideland Signal Corporation 13862-30 116585 E-Navcon Vibration and Shock Test Photogra Professional Text Plan for E-Navcon Vibration and Shock Test Photogra Professional Text Plan for E-Navcon A separation and Shock Test Photogra Professional Text Plan for E-Navcon 13862-30 116585 E-Navcon Vibration and Shock Test Photogra Professional Text Plan for E-Navcon 13862-30	Vibration and Shock 11/20 and 11/21/2012 EUT Serial #: EUT Part #: 13862-30 Test Technician: 116585 Supervisor: E-Navcon Vibration and Shock Test Photographs esponse in X Axis Y Ax Y Ax

Y Axis, Functional Test Setup

Table 4.3.2.13: Vib	Environmental Tration and Shock Test Photograp	Fest Report on the E-Nav ohs. Page 3	con by Tideland Sign	al Corporation
	Professional Te			
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 Photogra	phs		Page 3 of 4
	E-NAVCON SN 7065 INPUT VOLTAGE NOMINAL 12V M MIN/MAX 96 VD & 15 6VDC			
K1 R	esponse in Y Axis	Z A)	is, Test Setup	
NG	C C C C C C C C C C			

Z Axis, Functional Test Setup

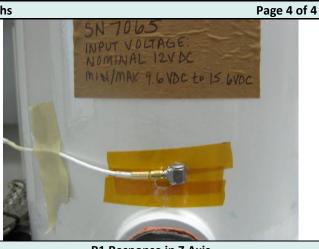


Table 4.3.2.14: Vibration and Shock Test Photographs, Page 4

Professional Testing, EMI, Inc.					
In Accordance With:	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

Vibration and Shock Test Photographs



R1 Response in Z Axis

Table 4.3.2.15: Shock Test Results, Page 1

14516 4.5.2.15. 5116	Table 4.3.2.13. Shock Test Results, Fage 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	11/20/2012 EUT Serial #: SN 7065				
Customer:	Tideland Signal Corporation	EUT Part #	#: E_I	NAVCON		
Project Number:	13862-30	Test Technician: John Crawford		n 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 + / -	

Page 2 of 7

Table 4.3.2.16: Shock Test Results, Page 2

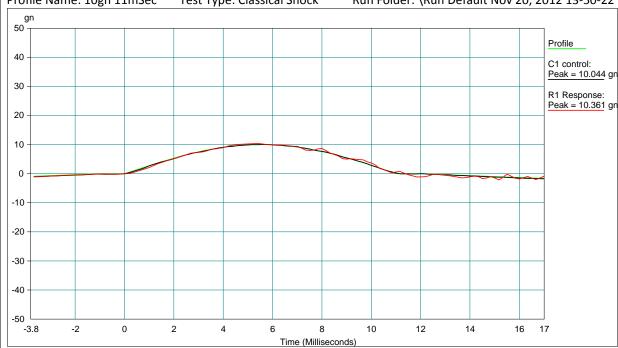
	Table 4.3.2.10. Shock Test Results, Fage 2				
Professional Testing, EMI, Inc.					
In Accordance With: Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 and ISO 13628-6					
Test Method:	Shock	Section:	Section 5.4.6		
Test Date:	11/20/2012	EUT Serial #:	SN 7065		
Customer:	Tideland Signal Corporation	EUT Part #:	E_NAVCON		
Project Number:	13862-30	Test Technician:	John Crawford		
Purchase Order #:	116585	Supervisor:	Yuki Fukuda		
Equip. Under Test:	E-Navcon				
Equip. Officer Test:	E-IVAVCOII				

+ X axis Op Shock 10g 11ms PN E-NAVCON SN 7065

Shock Test Results

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



Level: 100 % Block Size: 1024 Elapsed Pulses: 10

Frame Time: 0.170667 Seconds Control Peak: 10.043740 gn

Full Level Elapsed Pulses: 4 dT: 0.000167 Seconds

Demand RMS: 2.006089 gn Remaining Pulses: 0

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

20, 2012

Control RMS: 2.025975 gn

Pulse Type: Half Sine

Demand Peak: 10.000000 gn

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

Elapsed Pulses: 10

Page 3 of 7

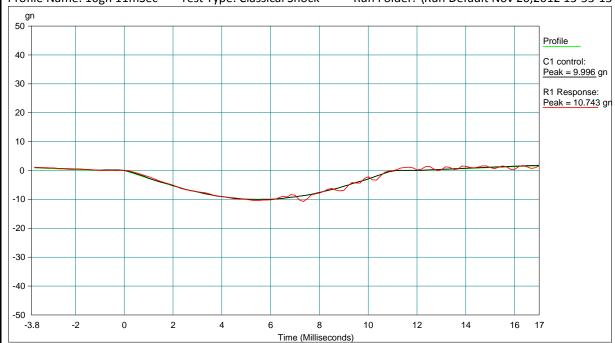
Table 4.3.2.17: Shock Test Results, Page 3

	Tuble 4.3.2.17. 3110ck 163t Results, 1 age 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

- 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 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

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

Pulse Type: Half Sine

Page 4 of 7

Table 4.3.2.18: Shock Test Results, Page 4

Tuble 4.5.2.12. Shock Test Results, Fuge 4					
Professional Testing, EMI, Inc.					
In Accordance With:	n 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				

+ 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 50 Profile 40 C1 control: Peak = 10.034 gn 30 R1 Response: Peak = 10.188 gn 20 10 0 -10 -20

Level: 100 % Block Size: 1024 Elapsed Pulses: 10

8

Time (Milliseconds)

10

12

16 17

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

Shock Test Results

Demand RMS: 2.006089 gn Remaining Pulses: 0 Pulse Type: Half Sine

Amplitude: 10.000000 gn

-2

-30

-40

-50 -3.8

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

Page 5 of 7

Table 4.3.2.19: Shock Test Results, Page 5

Table 4.3.2.13. 3110	Table 4.5.2.19: 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:	Equip. Under Test: E-Navcon				

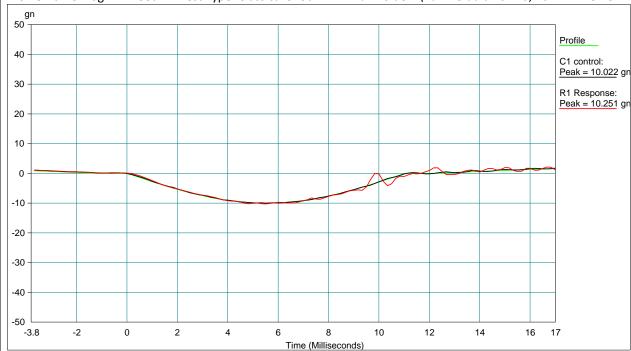
Shock Test Results

- Y axis Op Shock 10g 11ms

PN E-NAVCON SN 7065

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





Level: 100 % Block Size: 1024 Elapsed Pulses: 10

Frame Time: 0.170667 Seconds Control Peak: 10.022056 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

Control RMS: 2.025358 gn

Table 4.3.2.20: Shock Test Results. Page 6

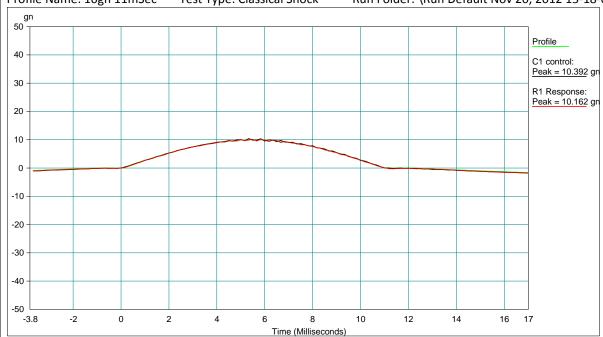
14510 11512120. 511041. 1654 1654 165					
Professional Testing, EMI, Inc.					
In Accordance With: Tideland Signal Test Plan for E-Navcon, Rev 0.3, Dated on 6/4/12 and ISO 13628-6					
Test Method:	Shock	Section:	Section 5.4.6		
Test Date:	11/20/2012	EUT Serial #:	SN 7065		
Customer:	Tideland Signal 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



Level: 100 % Elapsed Pulses: 10 Block Size: 1024

Frame Time: 0.170667 Seconds Control Peak: 10.391979 gn

Full Level Elapsed Pulses: 4 dT: 0.000167 Seconds

Demand RMS: 2.006089 gn Remaining Pulses: 0

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

Control RMS: 2.029878 gn

Pulse Type: Half Sine

Demand Peak: 10.000000 gn

Page 7 of 7

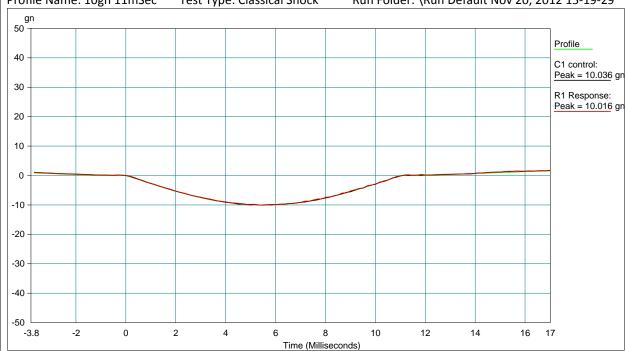
Table 4.3.2.21: Shock Test Results, Page 7

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					
Section:	Section 5.4.6				
EUT Serial #:	SN 7065				
EUT Part #:	E_NAVCON				
Test Technician:	John Crawford				
Supervisor:	Yuki Fukuda				
	Section: EUT Serial #: EUT Part #: Test Technician:				

Shock Test Results
PN E-NAVCON SN 7065

- Z axis Op Shock 10g 11ms PN E-NA 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



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

Full Level Elapsed Pulses: 4 dT: 0.000167 Seconds
Demand RMS: 2.006089 gn Remaining Pulses: 0

.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	Environmental Test Report on the E-Navcon by Tideland Signal Corporation
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