



Electromagnetic Compatibility Test Report

Prepared in accordance with

Product Standard:

FCC Part 15

on

Footswitch

Hercules Industrial Switch

Prepared for:

Linemaster Switch

29 Plaine Hill Road

Woodstock, CT 06281

Prepared by:

TUV Rheinland of North America, Inc.





30762628.002 Linemaster - Industrial Switch FCCSeite 2 von 48Report No.:Part 15.247Page 2 of 48

A	uftraggeber : Client:	Linemaster Switch 29 Plaine Hill Road Woodstock, CT 0628	1		
Bezeichnung: <i>Identification:</i>	Footswit	ch	Serien-Nr.: Serial No.	: PROTO	YPE
Gegenstand der Prüfung: Test item:	Hercules	Industrial Switch	Prüfdatum Date tested	()ctober	8th -10th 2007
Prüfort: Testing location:	12 Comm Newtown	einland of North Ameri nerce Road a, CT 06470-1607 \$ 200111-0	ca		
Prüfgrundlage: Test specification:	FCC Part	(b)(5) and 1.1310.	etion 15.247 (a)(2), FCC Par 15 , FCC Part 15.247 (e), FCC Part 15.2	(c), 15.205, 15.	
Prüfergebnis: Test Result	oben gen	tehend beschriebene annter Prüfgrundlag ove test standard(s)	0.0	- I	_
geprüft / tested by.	Dieter Balda	amus	kontrolliert / r	eviewed by: Ra	1 11 3 4 11
					indali Masline
22 October 2008			22 October 2008		indali Masline
Datum	Name	Unterschrift	Datum	Name	Unterschrift
Datum Date	Name Name	Unterschrift Signature	Datum Date	Name Name	
Datum			Datum		Unterschrift
Datum Date Sonstiges: Other Aspects: Abkürzungen: OK, Pass, Co	Name ompliant, Complies = mpliant, Does not Corge		Datum Date None Abbreviations: OK, Fail.		Unterschrift Signature lies = passed
Datum Date Sonstiges: Other Aspects: Abkürzungen: OK, Pass, Cc Fail, Not Co Prüfgrundla	Name ompliant, Complies = mpliant, Does not Corge	Signature entspricht Prüfgrundlage	Datum Date None Abbreviations: OK, Fail, N/A	Name Pass, Compliant, Comp, Not Compliant, Does N = not applicable	Unterschrift Signature lies = passed

QF094004 Revision 070202



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1 General Information

1.1 Scope

This report is intended to document the status of conformance with the requirements of the FCC Part 15C, based on the results of testing performed on October 8th -10th 2007 on the Footswitch, Model No. Hercules Industrial Switch, manufactured by Linemaster Switch. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT (Equipment Under Test) in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.





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1.3	Sum	mary of T	Test Results						
	Linema	ster Switch		Tel	(860) 974	4-1000	Contact	Mark Groch	owski
Applicant	_,	ne Hill Road tock, CT 0628	1	Fax	(860) 974	4-0502	email	MGrochows om	ski@linemaster.c
Type of Equip	ment	Footswitch		Model Number		Hercul	les Industrial	Switch	
Standa	rds		Description	S	Severity L	evel or I	Limit	Criteria	Test Result
FCC Part 15		Radio Fr	requency Devices -Part C	See cal	See called out basic standards below			See Below	Complies
FCC Part 15.24	7 (b) (3)		m Bandwith of a Direct ence Spread Spectrum System	500kHz on a 6dB Bandwith, 2.405 GHz - 2.480 GHz			Limit	Complies	
FCC Part 15.247 (b) (3)		Max	imum Output Power	1 Watt (30dBm)		Limit	Complies		
FCC Part 15.24 and 1.1310	7 (b)(5)	RF H	uman Exposure Limit	1.0 (mW/cm2)		Limit	Complies		
FCC Part 15.247 (c), 15.205, 15.209		Radiat	ed Spurious Emissions	-20dBc, 15.205 (a), 15.209 (a)		Limit	Complies		
FCC Part 15.24	7 (e)	Trans	mitter Power Density	8 dBm/3kHz		Limit	Complies		
FCC Part 15.20	7	Со	nducted Emissions	ted Emissions 15.207 (a)		(a)			Complies
FCC Part 15.21:	rt 15.215 (c) Frequency Stability		requency Stability	Containment of 20dB,			Limit	Complies	





2 Laboratory Information

2.1 Accreditations & Endorsements

US Federal Communications Commission

TUV Rheinland of North America located at 12 Commerce Road, Newtown CT is accredited by the commission for performing testing services for the general public on a fee basis. This laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (Registration No 889954). The laboratory scope of accreditation includes: Title 47 CFR Part 15, and 18. The accreditation is updated every 3 years.

NIST / NVLAP

Program, which is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Standard 17025:2005 (Lab code: 200111-0). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

Industry Canada

Registration No.: 3466D-1. The OATS has been accepted by Industry Canada to perform testing to 3 and to 10m, based on the test procedures described in ANSI C63.4-2003.

2.2 Measurement Uncertainty

General

The estimated combined standard uncertainty for conducted immunity measurements is \pm 1.4dB.

The estimated combined standard uncertainty for radiated emissions measurements is \pm 1.6 dB.

The estimated combined standard uncertainty for conducted emissions measurements is \pm 1.2dB.

2.3 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Standard 17025:2005. Equipment calibration records are kept on file at the test facility.

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TUV Rheinland test mark. This report must not be used by the applicant to claim product endorsement by TUV Rheinland, NVLAP or any agency of the United States Government.





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2.4 Measurement Equipment Used

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal dd/mm/yy	Next Cal dd/mm/yy	Test
Power Supply	California Instruments	5001iX	HK53766	08/04/07	08/04/08	All
Antenna Horn	Emco	3115	9402-4227	03/17/08	03/17/10	RE, RI
Antenna, Log. Periodic	Emco	3146	9309-3691	06/26/06	06/26/08	RE, RI
Antenna, Bicon	Emco	3108	2234	06/26/06	06/26/08	RE, RI
Receiver	Hewlett Packard	HP 8546A, 85460A	3330A00125, 3325A00134	03/14/08	03/14/09	CE, DP, CE
Spectrum Analyzer	Hewlett Packard	HP 8593E	3410A01090	06/26/08	06/26/09	CE, DP, CE
Antenna	Sunol Sciences	JB3	A022707	03/08/07	03/08/09	RE,RI

Note: CE = Conducted Emissions, CI= Conducted Immunity, DP=Disturbance Power, EFT=Electrical Fast Transients, ESD = Electrostatic Discharge, FLI=Flicker, HAR=Harmonics, MF=Magnetic Field Immunity, RE=Radiated Emissions, RI=Radiated Immunity, SI=Surge Immunity, VDSI=Voltage Dips and Short Interruptions





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3 Product Information

3.1 Product Description

The EUT is a wireless foot pedal used for various applications in the industrial environment. The wireless system eliminates the nuisance of wires under foot while invisible waves fill a room with 360° of signal. The EUT consist of a wireless foot pedal transmitter and a receiver; one (the transmitter) used with batteries and one (the receiver) used with an AC/DC adapter. The receiver also sends a signal every second to control de antenna output power of the transmitter

3.2 Equipment Modifications

No modifications were needed to bring product into compliance.

3.3 Test Plan

The EUT product information, test configuration, mode of operation, test types, test procedures, test levels, pass/failure criteria, in this report were carried out per the product test plan located in appendix A of this report





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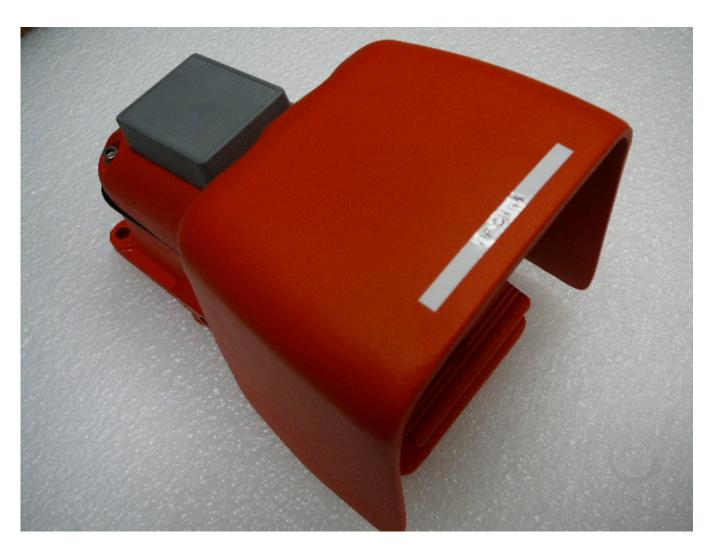


Figure 1 – Photo of EUT (Transmitter)





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4 Emissions

4.1 Spectrum Bandwidth

This test measures the spectrum bandwidth of the intentional radiator signal generated by the EUT.

4.1.1 Over View of Test

Results	Complies (as tested per this report)					10/08/20	007	
Standard	FCC Part 15.247 (b) (3)							
Product Model	Hercules Industrial S	Switch		Serial#	Protoy	be		
Configuration	See test plan for deta	ails						
Test Set-up	Tested @ 3m on O.	Tested @ 3m on O.A.T.S. placed on turn-table, see test plans for details						
EUT Powered By	AC/DC Adapter & Batteries	Temp	22°C	Humidity	45%	Pressure	998mbar	
Frequency Range	2.405 GHz - 2.480 GHz @ 3m							
Perf. Criteria	500kHz. (Below Lir	nit)	Perf. Ver	ification	Readings Under Limit			
Mod. to EUT	None		Test Perf	ormed By	Dieter Baldamus			

4.1.2 Test Procedure

Radiated and FCC emissions tests were performed using the procedures of ANSI C63.4 including methods for signal maximizations and EUT configuration. The photos included with the report show the EUT in its maximized configuration.

The frequency range from 2.405-2.480 GHz was investigated for radiated emissions, testing the lowest middle and highest channels.

Radiated emission testing was first performed at a distance of 3 meters in the semi-anechoic chamber in order to identify the specific frequencies for which these measurements will be made on the 3m OATS.

4.1.3 Deviations

There were no deviations from the test methodology listed in the test plan.

4.1.4 Final Test

All final radiated emissions measurements were below (in compliance) the limits.

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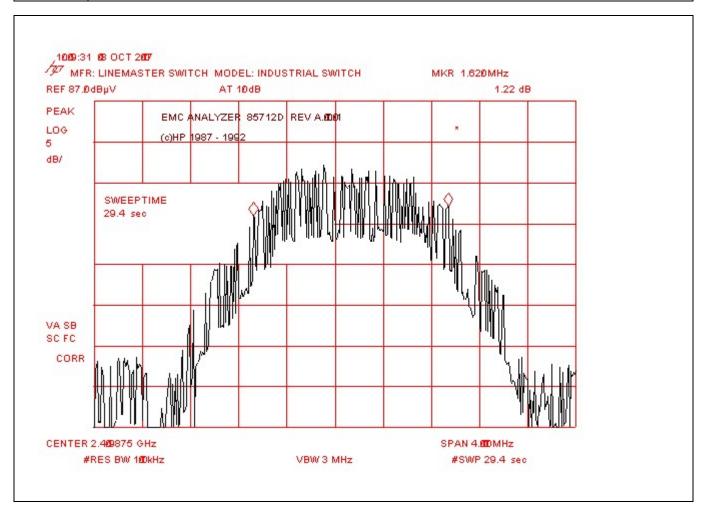




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4.1.5 Summary of Final Data

NOTES:	Spectrum Bandwidth
	Low Frequency



ANTENNA/COUPLER:										
9124 Bicon	3109 Bicon	CBL6140 X-Wing	NNB-4/63TL LISN							
3146 Log Per	☐ 3115 Horn	☐ JB3 Bilog	NNB-4/200X LISN							
3106 Horn	CBL6112B Bilog	NSLK 8126 LISN	MDS-21 Clamp							
MEAS TYPE:	POLARIZATION:	DISTANCE:	LOCATION:							
Radiated Prescan	Vertical	3 Meter	OATS							
Radiated Final	Morizontal	10 Meter	Semi-Anechoic							
Conducted	Line	Meter	Shielded Room							
Disturbance Power	Neutral Neutral	│	Factory Floor							
Other	□ NA		Other							





AMERICA'S FOOT SWITCH LEA	DER .		riecisely night.	
Report No.:		30762628.002	Page 13 of 4	18
NOTES:		Spectrum Bandwidt Middle Frequency	h	
VA SB SC FC CORR	ER SWITCH MODEL: INDUSTRIA AT 10dB EMC ANALYZER 85712D REV (c)HP 1987 - 1992		-1.438 MHz -1.14 dB	
CENTER 2.445250/GHz #RES BW 1800ki		.W 180kHz	PAN 5.800 MHz #SWP 29.80 sec	
	A % TEN	ENNA (COUDI ED		—
9124 Bicon 3146 Log Per 3106 Horn MEAS TYPE: Radiated Prescan Radiated Final	3109 Bicon 3115 Horn CBL6112B Bilog POLARIZATION: Vertical Horizontal	ENNA/COUPLER: CBL6140 X-W JB3 Bilog NSLK 8126 LI DISTANCE: 3 Meter 10 Meter	NNB-4/200X LISN	
Conducted Disturbance Power	Line Neutral	Meter NA	Factory Floor	

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4.1.6 Tabulated Test Data

Radiated Emissions	Measure	ments				
Standard:	47 CFR 15	5.247 (a) (2)			Date:	10/8/2007
Device Tested:	Linemaste	r Switch - Indust	rial Switch		File:	07100805 6dB Bandwith.xls
	1					
				Minimum		
				Limit □□		
				(Average		
				+		
				Correction		
	Freq	6dB Bandwith	Minimum Limit	Factors -		
Meas #	(MHz)	(MHz)	(MHz)	Limit)	Result	Comment
Channel 1 (2410GHz)	2409.35	1.6200	0.5000	-1.12	Complied	
Channel 8 (2450GHz)	2445.00	1.4380	0.5000	-0.94	Complied	
Channel 15 (2480GHz)	2480.24	1.5500	0.5000	-1.05	Complied	
Tested by:	Dieter Bald	<u>l</u> damus				





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4.1.7 Photos



Figure 2 - Radiated Emissions Test Setup (O.A.T.S.)





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4.2 Maximum Output Power

This test measures the radiated electromagnetic levels of the intentional radiator generated by the EUT through the antenna port.

4.2.1 Over View of Test

Results	Complies (as tested per this report)					Date	10/08/200)7	
Standard	FCC Part 15.247 (b)	FCC Part 15.247 (b) (3)							
Product Model	Hercules Industrial S	witch		Sei	rial#	Protoy	<i>r</i> pe		
Configuration	See test plan for detail	ils							
Test Set-up	Tested @ 3m on O.A.T.S. placed on turn-table, see test plans for details								
EUT Powered By	AC/DC Adapter & Batteries	Temp	22°C	Hı	umidity	45%	Pressure	998mbar	
Frequency Range	2.405GHz - 2.480GH	Hz @ 3m							
Perf. Criteria	1 Watt (30dBm) (Bellow Limit)	Perf. Verification		ì	Readings Under Limit for L1 and L2			L1 and L2	
Mod. to EUT	None	Test Per	3y	Dieter E	Baldamu	ıs			

4.2.2 Test Procedure

Radiated emissions tests were performed using the procedures of ANSI C63.4 including methods for signal maximizations and EUT configuration. In addition the alternative test procedure, described in the "Measurement of Digital Transmission Systems", from March 23, 2005, was followed.

The photos included with the report show the EUT in its maximized configuration.

The frequency range from 2.405-2.480 GHz was investigated for radiated emissions, testing the lowest middle and highest channels.

Radiated emission testing was first performed at a distance of 3 meters in the semi-anechoic chamber in order to identify the specific frequencies for which these measurements will be made on the 3m OATS.

4.2.3 Deviations

There were no deviations from the test methodology listed in the test plan.

4.2.4 Final Test

All final radiated emissions measurements were below (in compliance) the limits.

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4.2.5 ES:	ort No.: Summary			3	0762628	2 002				
	Summary					0.002				Page 17
ES:		of Final	Data							
				Duty	y Cycle	Measu	rement			
	ØBOCT 2007 LINEMASTER SW	ITCH MODI	EL MINUS	TRIAL CVA	тсн	MIZ	D 484 25 -			
REF 107.0d8		AT 1		TRIAL SW	II CH	IVIE		3077 dB		
PEAK	EMC	ANALYZER	85712D	REV A.006	n					
LOG 10 -	(c)HF	1987 - 199	2	in the same of the same of						
dB/										
	MARKER	2	8							
	101.25 msec	h	1	1		\Diamond	N	1		
	3077 dB									
			S 0							
	1 1						M			
VA SB										
SC FC	In the terminal termi	- h		Wagner Land	who	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		J. San	Mandratan	
CORR	60									
L										
CENTER 2.4	411600 GHz ES BW 3.0MHz			VBW 1 N	4H-		# CLOSE	SPAN 6		
#115	-0 D00 3.D10/HZ			VOW 1 N	IIIZ		#500f	om mse (
			A	NTENN			<u>.</u>			
24 Bicon 46 Log Per		9 Bicon 15 Horn		☐ CBL6	5140 X-V Bilog	Ving			=	/63TL LISN /200X LISN
06 Horn		3 Horn 3L6112B B	ilog	_	8126 L	ISN			=	21 Clamp
S TYPE		ARIZAT		DISTA					LOCATI	ON:
adiated Pre adiated Fin	I =	rtical rizontal		3 Met 10 M					OATS Semi-A	nechoic
onducted				=	Meter				_ =	ed Room

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Other

NA

Other_





	VS FOOT SWITCH L	EADER									
Re	eport No.:				307	'62628.C	002				Page 18 o
ΓES:					Duty	Cycle 1	Measur	ement			
	ØBOCT2ØT		TCH MODE	EL: INDUS	STRIAL SWIT	гсн	MK	≳ 937.50u	ISEC		
REF 107.0			AT 1						49 d	В	
PEAK LOG 10			NALYZER 1987 - 199		REV A. 606 1						
dB/	MARKER 937.50μs 49 dB			2 \$							
VA SB SC FC CORR	mughandyle	an lahranan	aah,m.ham	W	por Carrandad de	nhh\hma.ir	Averanga	uvvvvvV	hoholoo	N/MANA	
	2.411000 GH: RES BW 3.0				VBW 1 MH	Ηz		#SWF	SPANI 9 15.0 ms		
				A	NTENNA	A/COU	PLER:				
124 Bico 146 Log 106 Hori	Per		☐ 3109 Bi ☑ 3115 H ☐ CBL61	icon		CI JI	3L6140 X 33 Bilog SLK 8120	_		NNB-4	//63TL LISN //200X LISN 21 Clamp
AS TYI Radiated Radiated Conducted Disturban	Prescan Final		Vertica Vertica Horizo Line Neutra	l ntal	<u> </u>	$\boxtimes 3$	ANCE Meter Meter Meter			Shield	





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4.2.6 Tabulated Test Data

Standard:	47 C FR 15	.247(b) (3)		8				18 3		3		Pred	coan/Final:	Final
Device Tested:	Unem as le	switch - Ind	us Irlai Swiich									3 777779	Distance:	3.0m
Meas #	Freq (MHz)	Me asured Pe ak (dB p V/m)	Anlenna Correction Factor (dB)	Corre clion		Corrected Melasured Peak (Vitn)	EUT Anlenna Gain (dBl)	Total Peak EIRP (m Walls)	EIR P		Ave rage	Peak Umil 1 Wall (30d Bm)	Peak (d 8) 0	Re sul l
Channel 1 (2+10GHz)	2409.35	89.93	31.10	23.60	97 .43	0.07.44	2.00	0.83	-0.81	-36.88	-37.69	30.00	-67.69	Compiled
Channel 8 (2450GHz)	2445.48	84.10	31.20	23.70	91.60	0.0380	2.00	0.22	-6.64	-36.88	-43.52	30.00	-7 3.52	Compiled
Channel 15 (2480G Hz)	2480.24	81.22	31.10	23.09	89.23	0.0289	2.00	0.13	-9.01	-36.88	-+5.89	30.00	-7 5.89	Compiled
Tesled by:	Die ler Bak	amus					2			- 1				

Average Values were calculated based on the duty cycle of the transmission frequency

Measured pulse is 0.895 µS, there are 1.6 packages in 100ms

Duty Cycle = 0.895*1.6/100 = 0.0143

Duty Cycle = 20log(0.0143) = -36.88 Average Value = PeakValue (in dBuV) – Duty Cycle

Corrected Measured Peak (dBuV) = Measured Peak + Antenna Correction Factor - Cable and Amplifier factor

According to Alternative Test Procedure of DTS from March 23, 2005 Total EIRP = (E*d) squared/(30*G)

e.g. for 2.410 GHz

=(0.0509*3)^2/(30*2)= 0.0003888 Watts = -4.103025





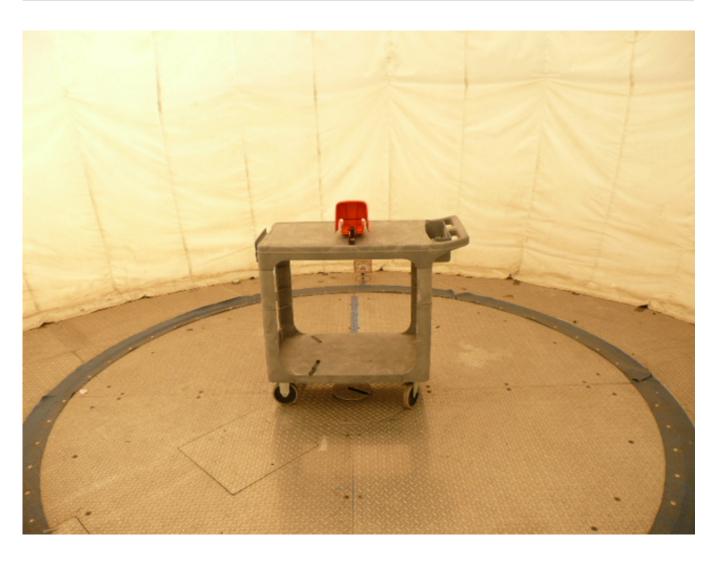


Figure 3 - Maximum Output Power Test Setup (O.A.T.S.)





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4.3 RF Human Exposure Limits

This test evaluates the RF Human Exposure to prove the safety of radiation harmfulness to human body.

4.3.1 Test Over View

Results	Complies (as tested	l per this	report)		Date	08/10/2	207		
Standard	FCC Part 15.247 (b)	FCC Part 15.247 (b)(5) and 1.1310							
Product Model	Hercules Industrial S	Hercules Industrial Switch Serial#					Protoype		
Configuration	See test plan for deta	See test plan for details							
Test Set-up	Tested in shielded room EUT placed on table								
EUT Powered By	AC/DC Adapter & Temp 22°C Batteries		22°C	Humidity	45%	Pressure	998mbar		
Frequency Range	2.405GHz - 2.480G	Hz @ 3n	1						
Perf. Criteria	1.0 (mW/cm2) (Bell Limit)	.0 (mW/cm2) (Bellow imit)		ification Readings under Limit		imit			
Mod to EUT	None	,							

Test Procedure

In this document, we try to prove the safety of radiation harmfulness to the human body for our product. The limit for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 is followed. The Gain of the antenna used in this product is measured in a Semi-Anechoic Chamber, and also the maximum total power input to the antenna is measured. Through the Friis transmission formula (see section 4.9.6) and the maximum gain of the antenna, we can calculate the distance, away from the product, where the limit of MPE is reached.

Although the Friis transmission formula is a far field assumption, the calculated result of that is an over-prediction for near field power density. We will take that as the worst case to specify the safety range.

RF Exposure Limit

According to FCC 1.1310 table 1: The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b)

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LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm2)	Average Time (minutes)				
	(A)Limits For	Occupational / Con	trol Exposures					
300-1500			F/300	6				
1500-100,000			5	6				
	(B)Limits For General Population / Uncontrolled Exposure							
300-1500			F/1500	6				
1500-100,000		•••	1.0	30				

F = Frequency in MHz

Deviations

There were no deviations from the test methodology listed in the test plan

Antenna Gain

The maximum Gain measured in Semi-Anechoic Chamber is 2.14 dBi or 1.637mW (numeric).

Test Results

Output Power into Antenna & RF Exposure value at distance 20cm:

Calculations for this report are based on highest power measurement and the highest gain of the antenna. Limit for MPE (from FCC part 1.1310 table 1) is 1.0 mW/cm² for 2.4-2.483.5 GHz.

Highest Pout is 0.83 mW (-0.81dBm, including antenna factor), and R is 20cm.

 $Pd = (0.83) / (4*\pi*20^2) = 0.0001651 \text{ mW/cm}^2$, which is 0.99983 mW/cm² below to the limit.

Sample Calculation

The Friis transmission formula: $Pd = (Pout*G) / (4*\pi*R^2)$

Where;

Pd = power density in mW/cm²

Pout = output power to antenna in mW

G = gain of antenna in linear scale

 $\pi \approx 3.1416$

R = distance between observation point and center of the radiator in cm

Ref.: David K. Cheng, Field and Wave Electromagnetics, Second Edition, Page 640, Eq. (11-133).

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4.4 Radiated Spurious Emissions

This test measures the radiated electromagnetic levels of the intentional and unintentional radiator generated by the EUT.

4.4.1 Test Over View

Results	Complies (as teste	Complies (as tested per this report)					7		
Standard	FCC Part 15.247 (c),	FCC Part 15.247 (c), 15.205, 15.209							
Product Model	Hercules Industrial	Hercules Industrial Switch Serial#					Protoype		
Configuration	See test plan for de	See test plan for details							
Test Set-up	Tested @ 3m on O.A.T.S. placed on turn-table, see test plans for details								
EUT Powered By			22°C	Humidity	45%	Pressure	998mbar		
Frequency Range	2.405GHz - 2.480	GHz @ 3m							
Perf. Criteria	-20dBc, 15.205 (a)	odBc, 15.205 (a), 15.209 (a) Perf. Verification			Readings under Limit				
Mod to EUT	None	None Test Performed By Dieter Baldamus							

4.4.2 Test Procedure

Radiated and FCC emissions tests were performed using the procedures of ANSI C63.4 including methods for signal maximizations and EUT configuration. The photos included with the report show the EUT in its maximized configuration.

The frequency range from 2.405-2.480 GHz was investigated for radiated emissions, testing the lowest middle and highest channels.

Radiated emission testing was first performed at a distance of 3 meters in the semi-anechoic chamber in order to identify the specific frequencies for which these measurements will be made on the 3m OATS.

4.4.3 Deviations

There were no deviations from the test methodology listed in the test plan.

4.4.4 Final Test

The Radiated Spurious Emissions of the EUT were below the limits specified in the standard.

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AMERICA'S FOOT SWITTCH LEADE	201			, ,					
Report No.:		30762628.002		Page 24 of 48					
4.4.5 Summa	4.4.5 Summary of Final Data								
NOTES: Radiated Emissions Prescan									
(ሕን) 09:50:04 (MFR: L]N MARKER 51.7 MHz 6.06 dBμ	DCT 06, 2007 EMASTER SWITCH MO	ACTV DET: PEAH MEAS DET: PEAH MK	(
LDG REF 60.0 10 dB/ #ATN 0 dB	dB _µ V/m		PREAMP DN						
VA VB SC FC ACORR	wall glasse was worken	Age Commission of the second contraction of	A Commission of the Commission						
START 30.0 MHz L JF BW 1			300,0 MHz P 253 msec						
9124 Bicon 3146 Log Per 3106 Horn	ANTEN 3109 Bicon 3115 Horn CBL6112B Bilog	NA/COUPLER: CBL6140 X-Wing JB3 Bilog NSLK 8126 LISN	☐ NNB-4/63TL ☐ NNB-4/200X ☐ MDS-21 Clar	LISN					
MEAS TYPE: Radiated Prescan Radiated Final Conducted Disturbance Power	POLARIZATION: Vertical Horizontal Line Neutral	DISTANCE: 3 Meter 10 Meter Meter NA	LOCATION: OATS Semi-Anecho Shielded Roo Factory Floor	om					

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Other_

Disturbance Power

Neutral

] NA

Factory Floor

Other_





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NOTES: Radiated Spurious Emissions Prescan								
09:53:49 DCT 06, 2007 MFR: LINEMASTER SWITCH MODEL: INDUSTRIAL SWITCH RECE MARKER 961.6 MHz 26.50 dBuV/m 26.50 dBuV/m								
LDG REF 60.0 dBµV 10 dB/ #ATN 0 dB		> DN						
VA VB SC FC ACORR								
START 300.0 MHz JF BW 120 kH	STOP 1.0000 z AVG BW 300 kHz SWP 656							
	ANTENNA/COUPLER:							
MEAS TYPE: POLARIZATION: DISTANCE: LOCATION: □ Radiated Prescan □ Vertical □ 3 Meter □ OATS □ Radiated Final □ Horizontal □ 10 Meter □ Semi-Anechoic □ Conducted □ Line □ Meter □ Shielded Room □ Disturbance Power □ NA □ Factory Floor □ Other □ NA □ Other								





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NOTES:	Radiated Spurious Emissions Prescan						
@@ 09:57:33 OCT 00 MFR: L]NEMAST MARKER 1.008 GHz 35.75 dBµV∕m	3, 2007 ER SWITCH MODEL: INDUSTRIAL SWITCH R ACTV DET: PEAK MEAS DET: PEAK QP AV MKR 1.008 35.75 dB)	JG GHz					
LDG REF 69.0 dBuV dB/ #ATN 0 dB		DN					
DL 49.0 dBuV/m MA VB SC FC ACORR	the first and the first the second of the se						
START 1.000 GHz JF BW 1.0 MH	STOP 2.400 z AUG BW 3 MHz SWP 40.0 1	2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 -					
ANTENNA/COUPLER: □ 9124 Bicon □ 3109 Bicon □ CBL6140 X-Wing □ NNB-4/63TL LISN □ 3146 Log Per □ 3115 Horn □ JB3 Bilog □ NNB-4/200X LISN □ 3106 Horn □ CBL6112B Bilog □ NSLK 8126 LISN □ MDS-21 Clamp □ MDS-21 Clamp □ MDS-21 Clamp □ NSLK 8126 LISN □ NSLK 8126 LISN □ NSLK 8126 LISN □ NSLK 8126 LISN □ MDS-21 Clamp □ NSLK 8126 LISN □ NSLK 8126 LISN □ N							
Radiated Prescan Radiated Final Conducted Disturbance Power	LARIZATION: Vertical Horizontal Line Neutral NA DISTANCE: 3 Meter 10 Meter Meter NA	OCATION: OATS Semi-Anechoic Shielded Room Factory Floor Other					

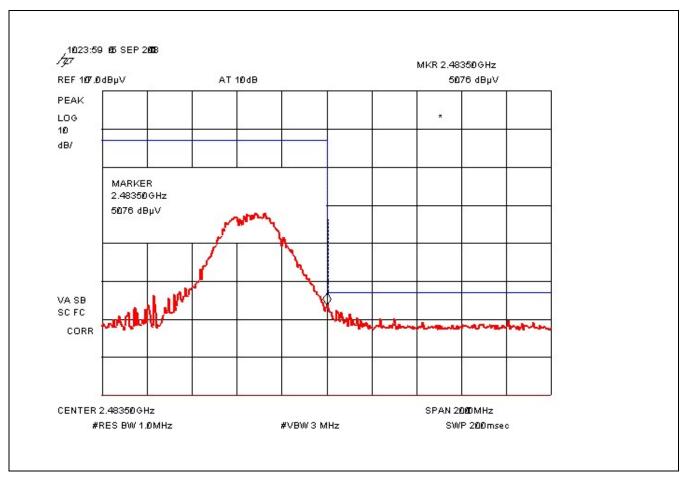




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4.4.6 Band Edge Graphs

	_	-	
NOTES:			
			Band Edge Measurement
			(Radiated)



ANTENNA/COUPLER:								
9124 Bicon	3109 Bicon	CBL6140 X-Wing	NNB-4/63TL LISN					
3146 Log Per		☐ JB3 Bilog	NNB-4/200X LISN					
3106 Horn	CBL6112B Bilog	NSLK 8126 LISN	MDS-21 Clamp					
MEAS TYPE:	POLARIZATION:	DISTANCE:	LOCATION:					
Radiated Prescan	Vertical	⊠ 3 Meter	OATS					
Radiated Final	Morizontal	10 Meter	Semi-Anechoic					
☐ Conducted	Line	Meter	Shielded Room					
Disturbance Power	Neutral Neutral	□ NA	☐ Factory Floor					
Other	□ NA		Other					





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4.4.7 Tabulated Test Data

Radiated Emissions Measurements	sions Mea	suremen	ıts													
Standard:	47 CFR 15.247 (c)	247 (c), 15.2	. 15.209 and 15.205	205								Prescan/Final: Final	Final		Date:	Date: 10/8/2007
Device Tested:	Linemaster Switch - Industrial Switch	Switch - Ind	Justrial Swit	,ch								Distance: 3.0m	3.0m		File:	File: 07100809 Spurious Emissions.xls
			Antonno	Cable & Amplifier	100		Po de Carre			15 247	15 247					
		Measured	Correction		Measured		Average		15.209	Average Limit	_				Antenna	
		Peak	Factor	Factor		Duty Cycle	Value	15.209 Limit		(-20dBc)				Angle	Height	
Meas #	Freq (MHz) (dBµV/m)	(dBµV/m)	9	9	(dBµV/m)	(dBµV)	(dBµV/m)	(dBµV/m)	(dBµV/m)	(dBµV/m)	(dBµV/m)	Result	Polarization	(degrees)	(meters)	Comment
Lower Channel																
_	2409.35	86.83	31.10	23.60	93.33								Vertical	10	1.20	
2	2400.00	34.37	31.30	23.60	42.07	-36.88	5.19	53.98	-48.79	73.33	-68.14	Complied	Vertical	14	1.25	at bandedge
m	4820.14	46.38		23.90	53.58	-36.88	16.70	53.98	-37.28	73.33	-56.63	Complied	Vertical	5	1.20	2nd Harmonic
4	7214.06	43.75	31.10	23.90	50.95	-36.88	14.07	53.98	-39.91	73.33	-59.26	Complied	Vertical	358	1.10	3rd Harmonic
Middle Channel											0.00	Complied				
5	2445.48	87.78	31.20	23.70	95.28								Vertical	329	1.00	
9	4888.80	46.10	31.10	23.90	53.30	-36.88	16.42	53.98	-37.56	75.28	-58.86	Complied	Vertical	1	1.20	2nd Harmonic
7	7336.90	43.70	31.10	23.90	50.90	-36.88	14.02	53.98	-39.96	75.28	-61.26	Complied	Vertical	356	1.24	3rd Harmonic
High Channel											0.00	Complied				
ω	2480.24	86.41	31.10	23.09	94.42								Vertical	329	1.15	
6	2483.50	44.03	31.10	23.09	52.04	-36.88	15.16	53.98	-38.82	74.42	-59.26	Complied	Vertical	16	1.10	at bandedge
12	4959.10	46.67		23.90	53.87	-36.88	16.99	53.98	-36.99	74.42	-57.43	Complied	Vertical	10	1.00	2nd Harmonic
Ð	7441.40	47.09	31.10	23.90	54.29	-36.88	17.41	53.98	-36.57	74.42	-57.01	Complied	Vertical	5	1:00	3rd Harmonic
Tooks at less	- Indiana															
TESTED by: Dieter Daluarrus TEN Dhoinland of North Amorica, Inc.	Dieter Dalus	- 1	12 Commons Dood		Nowtown CT 06470		0 3CV (500-1-	Tal: One) 406 0888 Fax: One) 406 4009	0.000 400.0							
IO V MIRIII OI IV	ulli Allielica,	- 1	anialinio.		wrown, c.		31.(2003) 420-0	1000 F d.Y. (200) 420-4005							
	Average Val	ues were ca	alculated ba	ased on the	duty cycle	of the trans.	Average Values were calculated based on the duty cycle of the transmission frequency	ency								
	Measured Duty Cycle is 0.895µsec, and there are 16 packages in one second	uty Cycle is	s 0.895µsec	c, and there	are 16 paci	kages in on	e second									
		Duty Cycle	Duty Cycle = 0.895*16/1000 =	9/1000 =	1.43%											
		Duty Cycle	Duty Cycle = 20log (0.01432) =	1.01432) =	-36.8811											
	Average Value = Peak Value (in dBμV/m) - Duty Cycle	ue = Peak	Value (in d£	ЭµV/m) - Du	ty Cycle											
	Corrected M	easured Pe	eak (dBµV//r	n) = Measur	red Peak +	Antenna Co	rrection Fact	Corrected Measured Peak (dBuV/m) = Measured Peak + Antenna Correction Factor - Cable & Amplifier Correction Factor	nplifier Corr	ection Factor						
	Corrected Average = Corrected Measured Peak + Duty Cycle	verage = Co	orrected Me	asured Pea	k + Duty C	ycle										
	All Emissions are	ns are within	n the restric	within the restricted band specified at FCC part 15.205 (a)	secified at h	CC part 15	705 (a)									

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4.4.8 Photos



Figure 4 - Radiated Spurious Emissions Test Setup (Semi-Anechoic Chamber 2)







Figure 5 - Radiated Spurious Emissions Test Setup (O.A.T.S.)





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4.5 Transmitter Power Density Spectrum

This test is to evaluate

4.5.1 Test Over View

Results	Complies (as teste	ed per this	report)			Date	e 1	10/08/2	007
Standard	FCC Part 15.215 (c)								
Product Model	Hercules Industrial	Switch			Serial#	Prot	oype		
Configuration	See test plan for de	tails							
Test Set-up	Tested @ 3m on C).A.T.S. p	laced or	ı turı	n-table, see	test pla	ans for	r details	S
EUT Powered By	AC/DC Adapter & Batteries	Temp	22°C	Н	umidity	45%	Pres	ssure	998mbar
Frequency Range	2.405GHz - 2.480	GHz @ 3	m						
Perf. Criteria	8dBm in a 3kHz B	W	Perf. V	/erif	ication	Readi	ngs un	nder Lii	mit
Mod to EUT	None		Test P	erfo	rmed By	Dieter	Balda	amus	

4.5.2 Test Procedure

The PSD Option 2 test procedure, described in the "Measurement of Digital Transmission Systems", from March 23, 2005, was followed.

The Radiated Power Density was performed using a 100 sweeps over a 3kHz Resolution bandwidth and a 10 kHz Video bandwidth using a Peak detector.

The frequency range from 2.405-2.480 GHz was investigated for radiated emissions, testing the lowest middle and highest channels

Radiated emission testing was first performed at a distance of 3 meters in the semi-anechoic chamber in order to identify the specific frequencies for which these measurements will be made on the 3m OATS

4.5.3 Deviations

There were no deviations from the test methodology listed in the test plan for the Transmitter Power Density test.

4.5.4 Final Test

The EUT met the performance criteria requirement as specified in the test plan of this report and in the standards.

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TUV Rheinland test mark. This report must not be used by the applicant to claim product endorsement by TUV Rheinland, NVLAP or any agency of the United States Government.





4.5.5 Test Results

Radiated Emissions	Measure	ements-	Power Sc	ectral Den	sity					
Standard:	47 OFR 15	5.247 (d)							Date:	10/8/2007
Device Tested:	Linemeste	r Switch - Ir	ndustrial Sw	itch					File:	07100808 P.S.D.xls
			Antenna	Cable &	Carrected					
			Correction	-	Measured			MnimumLimit		
	Freq	Peak	Factor	Carrection	Peak	Power Spectral	MnimumLimit	□(Measured)		
Meas#	(MHz)	(dBµV/m)	(dB)	Factor (dB)	(dBµV/m)	Density (dBm)	(MHz)	PSD-Limit)	Result	Comment
Channel 1 (2410GHz)	2409.35	70.39	31.10	23.60	77.89	-29.10	8,0000	-37.10	Complied	
Channel 8 (2450GHz)	2445.00	7263	31.20	23.70	80.13	-26.86	80000	-34.86	Complied	
Channel 15 (2480GHz)	2480.24	69.34	31.10	23.09	77.35	-29.64	8,000	-37.64	Complied	
Tested by:	Dieter Balo	demus								
TUV Rheinland of North A	merica, Inc.	12 Com	nerce Road	Newtown,	CT 06470	Tel:(203) 426-08	888 Fax: (2003) 4	426-4009		

Corrected Measured Peak = Measured Peak = Antenna Factor - Cable & Amplifier Correction Factor

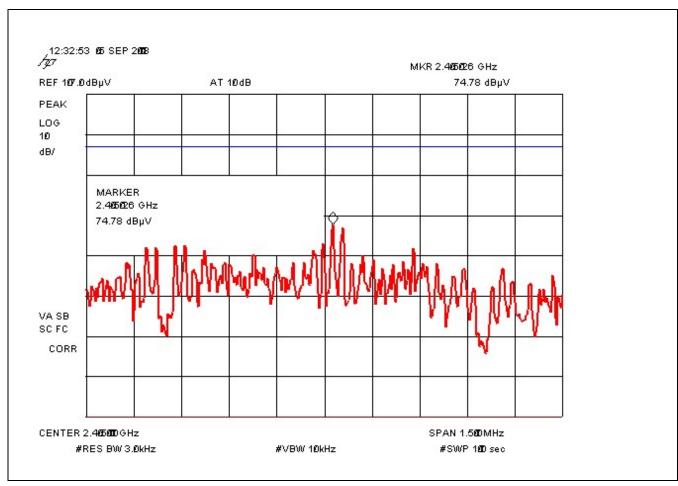




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INCOULT NO	30102020.002	1 446 33 01 70

4.5.6 Summary of Final Data

	·	
NOTES:		
	Transmitter Power Density Measurement	



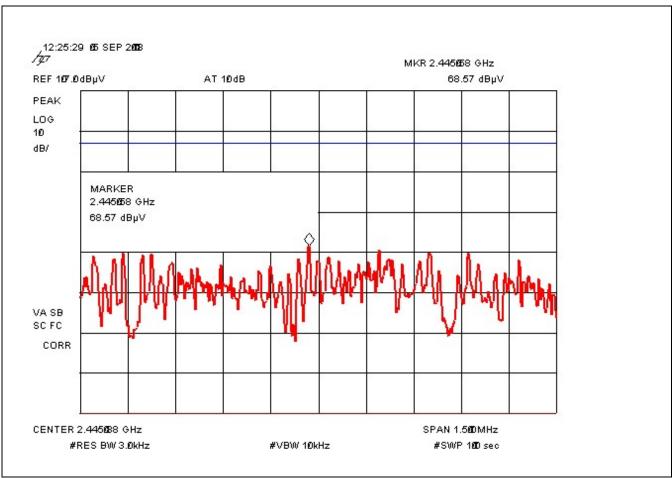
	ANTENNA	COUPLER:	
9124 Bicon	3109 Bicon	CBL6140 X-Wing	NNB-4/63TL LISN
3146 Log Per	⊠ 3115 Horn	☐ JB3 Bilog	NNB-4/200X LISN
3106 Horn	CBL6112B Bilog	NSLK 8126 LISN	MDS-21 Clamp
MEAS TYPE:	POLARIZATION:	DISTANCE:	LOCATION:
Radiated Prescan	Vertical	3 Meter	OATS
Radiated Final	Morizontal	10 Meter	Semi-Anechoic
Conducted	Line	Meter	Shielded Room
Disturbance Power	Neutral Neutral	□ NA	Factory Floor
Other	□ NA		Other





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NOTES:		
	Transmitter Power Density Measurement	

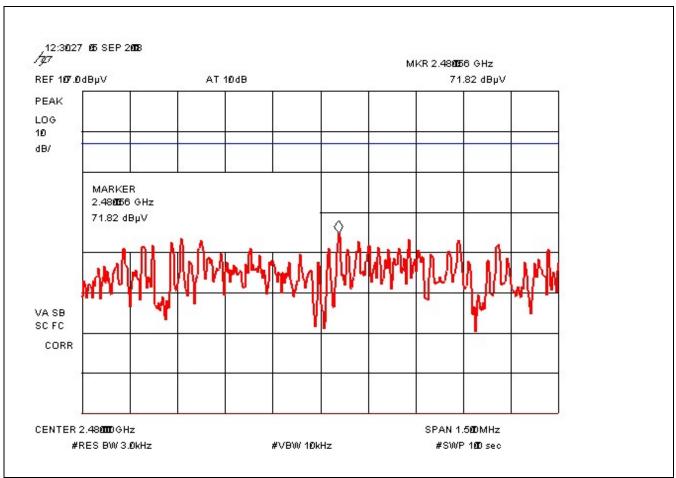


	ANTENNA	COUPLER:	
9124 Bicon	3109 Bicon	CBL6140 X-Wing	NNB-4/63TL LISN
3146 Log Per	3115 Horn	JB3 Bilog	NNB-4/200X LISN
3106 Horn	CBL6112B Bilog	NSLK 8126 LISN	MDS-21 Clamp
MEAS TYPE:	POLARIZATION:	DISTANCE:	LOCATION:
Radiated Prescan	Vertical Vertical	3 Meter	OATS
Radiated Final	Horizontal	10 Meter	Semi-Anechoic
☐ Conducted	Line	Meter	Shielded Room
☐ Disturbance Power	Neutral	□ NA	Factory Floor
Other	□ NA		Other





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NOTES:	Transmitter Power Density Measurement	



	ANTENNA/	COUPLER:	
9124 Bicon	3109 Bicon	CBL6140 X-Wing	NNB-4/63TL LISN
3146 Log Per	⊠ 3115 Horn	☐ JB3 Bilog	NNB-4/200X LISN
3106 Horn	CBL6112B Bilog	NSLK 8126 LISN	MDS-21 Clamp
MEAS TYPE:	POLARIZATION:	DISTANCE:	LOCATION:
Radiated Prescan	Vertical	3 Meter	OATS
Radiated Final	Morizontal	10 Meter	Semi-Anechoic
Conducted	Line	Meter	Shielded Room
Disturbance Power	Neutral Neutral	□ NA	Factory Floor
Other	□ NA		Other





4.5.7 Photos



Figure 6 – Transmitter Power Density Spectrum (O.A.T.S.)





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4.6 Frequency Stability

This test is to evaluate the performance of the EUT when subjected to high-energy disturbances on the power and interconnecting lines.

4.6.1 Test Over View

Results	Complies (as tested per this report)					10/09/200)7		
Standard	FCC Part 15.215(c)	FCC Part 15.215(c)							
Product Model	Hercules Industrial	Switch		Serial#	Protog	ype			
Configuration	See test plan for de	tails							
Test Set-up	Tested in shielded room. See test plans for details								
EUT Powered By	AC/DC Adapter Temp 22°C Humidit & Batteries				45%	Pressure	998mbar		
Frequency Range	2.405 GHZ – 2.480	GHz	Tempera	ture Range	0°C –	70°C			
Perf. Criteria	Containment of 200 frequency range	dB of	Perf. Verification Readings under Limit			imit			
Mod to EUT	None	Test Performed By Dieter Baldamus							

4.6.2 Test Procedure

EUT was place in a temperature chamber. Frequency and output power level were measured at room temperature. Temperature in the chamber was increased to 70°C and maintained till the EUT reached that temperature. Frequency and level was measured again. EUT was placed into a humidity chamber and temperature was set to 0 °C. Temperature was maintained till the EUT reached that temperature. Frequency and level were measured again.

4.6.3 Deviations

There were no deviations from the test methodology listed in the test plan for the Surge Immunity test.

4.6.4 Final Test

The EUT met the performance criteria requirement as specified in the test plan of this report and in the standards.

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TUV Rheinland test mark. This report must not be used by the applicant to claim product endorsement by TUV Rheinland, NVLAP or any agency of the United States Government.

TÜV Rheinland Inc., North American Headquarters, 12 Commerce Road, Newtown, CT 06470 - Tel (203)426-0888 - Fax (203)426-4009





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4.6.5 Summary of Final Test Results

Standard:	47 CFR 15.247 (d)		Date:	10/8/2007
Device Tested: Linemasterswitch - Industrial Switch			ch	File:	071008711 Freq Stability
Test Variation:	Temperature Var	iation			
	- 20dB Freq	Limit Freq	Frequency H		
Meas#	(MHz)	(MHz)	(MHz)	Result	Comment
Low Bandedge					
22°	2403.24	2400.00	3.24	Complied	
0°	2401.50	2400.00	1.50	Complied	
70°	2401.20	2400.00	1.20	Complied	
High Bandedge					
22°	2481.45	2483.50	-2.05	Complied	
0°	2482.50	2483.50	-1.00	Complied	
70°	2482.70	2483.50	-0.80	Complied	
ested by:	Dieter Baldamus				

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4.6.6 Photos

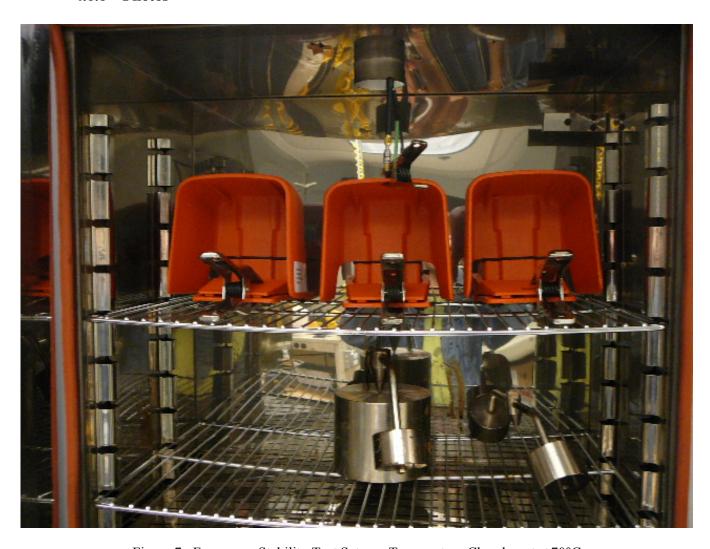


Figure 7 – Frequency Stability Test Setup – Temperature Chamber at +70°C







Figure 8 – Frequency Stability Test Setup – Humidity Chamber at 0°C





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Appendix A

5 Test Plan

This test report is intended to follow this test plan outlined here in unless other wise stated in this here report. The following test plan will give details on product information, standards to be used, test set ups and refer to TUV test procedures. The test procedures will give the steps to be taken when performing the stated test. The product information below came via client, product manual, product itself and or the internet.

5.1 General Information

Client	Linemaster Switch
Address	29 Plaine Hill Road
Address	Woodstock, CT 06281
Contact Person	Mark Grochowski
Telephone	(860) 974-1000
Fax	(860) 974-0502
email	MGrochowski@linemaster.com

5.2 Model(s) Name

Hercules Industrial Switch	

5.3 Type of Product

Footswitch





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5.4 Equipment Under Test (EUT) Description

The EUT is a wireless foot pedal used for various applications in the industrial environment. The wireless system eliminates the nuisance of wires under foot while invisible waves fill a room with 360° of signal. The EUT consist of a wireless foot pedal transmitter and a receiver; one (the transmitter) used with batteries and one (the receiver) used with an AC/DC adapter. The receiver also sends a signal every second to control de antenna output power of the transmitter.

5.5 Product Environment

	Residential	Hospital
	Light Industrial	Small Clinic
\boxtimes	Industrial	Doctor's office
	Other	

5.6 Countries

\boxtimes	USA
	Taiwan
	Japan
	Europe

^{*}Check all that apply

^{*}Check all that apply





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5.7 Applicable Documents

Standard	Description
FCC Part 15	Rado Frquency Devices -Part C
FCC Part 15.247 (a) (2)	Spectrum Bandwith of a Direct Sequence Spread Spectrum System
FCC Part 15.247 (b)	Maximum Output Power
FCC Part 1.1310	RF Human Exposure Limit
FCC Part 15.247 (c), 15.205, 15.209	Radiated Spurious Emissions
FCC Part 15.247 (d)	Transmitter Power Density of a Direct Sequence Spread Spectrum System
FCC Part 15.207	Conducted Emissions
FCC Part 15.215 (b)	Frequency Stability





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5.8 General Product Information

Size (Transmitter)	Н	cm	W	cm	L	cm
Weight (Transmitter)	kg Fork-Lift Needed		Lift Needed	No		
Size (Receiver)	Н	cm	W	cm	L	cm
Weight (Receiver)	kg		Fork-	Lift Needed	No	
Notes						

5.9 EUT Powered Information

6.9.1 Power Type

\boxtimes	AC	DC	\boxtimes	Batteries	Host -
	(Receicer)			(Transmitter)	

6.9.2 Power Information

	Name	Type	Voltage		Voltage		Frequency	Current	Notes
			min	max					
6VDC U	JSA AC/DC Adapter	Class 1	120VAC	120VAC	60Hz	500mA			
Notes	AC/DC Adpater Mod	els: GTM34	11-6-500						

5.10 EUT Modes Of operation

The EUT footswitch transmitter has 2 modes of operation. Switch ON or Switch OFF. Both modes were in operation during the test. The receiver was constantly on receiving signals from the footswitch transmitter.

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TUV Rheinland test mark. This report must not be used by the applicant to claim product endorsement by TUV Rheinland, NVLAP or any agency of the United States Government.

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5.11 EUT Configurations

Configuration	Description			
Configuration 1	Switch ON, Switch OFF			
7				
Note: all configurations are the same except as noted above				

5.12 EUT Clock/Oscillator Frequencies

	Less than 108MHz	FCC – scan up to 1GHz
	Less than 500MHz	FCC – scan up to 2GHz
	Less than 1000MHz	FCC – scan up to 5GHz
\boxtimes	Greater then 1000MHz	FCC – scan up to 5 th Harmonic or 40GHz (2.4GHz)

5.13 Electrical Support Equipment

Type	Manufacture	Model	Connected To
NA	NA	NA	NA

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	Item			ľ	Notes				
NA			NA						
			l						
5.15 EU	JT Eq	quipmen	t/Cabling In	formation					
EUT P			nected To	Location		Cable Type			
					Length	Shielded	Bea		
DC Inpu	t	AC/DC	Adapter	Receiver	1.5m	No	No		
5.16 E	TIT T	Doors							
		None For service personnel only							
			ll wear ESD s						
		ier	n wear LSD	<u> </u>					
	0.41	er							





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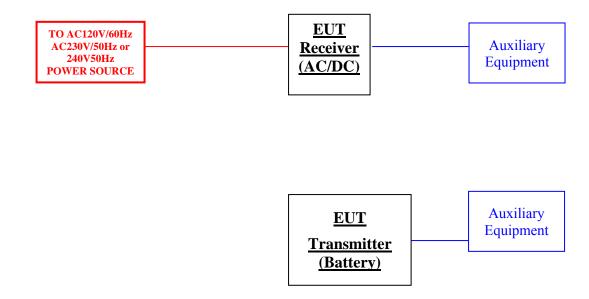
5.18 EUT Test Program

None

5.19 Monitoring of EUT during Testing

During the test a LED in the receiver indicates that the switch of the transmitter is ON. If the LED is off the foot switch is OFF as well.

5.20 EUT Configuration Block Diagram







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5.21 Constructional Data Form

TUV Rheinland		Please submit in duplicate					
D-51101 Köln 91		Gen-Ausw-Nr.	Aktenzeichen:			Anlage-Nr.	
D STIGITION 91			30762628.002 Linemaster - Industrial Switch FCC Part 15.249		ch FCC Part	1 of 1	
Am Grauen Stein/ Konstantin-Wille-Str. 1							
			C	EMC/EMV			
Itaaa I iatiaa Na			Cons	structional Data Form			
Item Listing No. & Location in EUT	Component / Sub-Assembly			Part No. & Description	Freq.; ERP/A		
1.1	Enclos	ure		Metal (Footswitch Transmitter)	2.40	GHz	
1.2	Enclos	ure		Plastic (receiver)	2.40	ЗНz	
2.1	AC/DC Adpater			GTM341-6-500	N.	A	
3.0	Antenna			Nano Blue	2.00	∄Bi	
TUV Rheinland Prüfstelle für Gerätesicherheit		Applicant					
Köln, den:				Ort/place:	Datum/date:		
(report copy not signed)		(report copy not signed)					
TUV Rheinland Prüfstelle für Gerätesicherheit		(Stempel und Unterschrift des stamp and signature of					