### Project 18583-15

### Hetronic MFS ERGO120

### **Wireless Certification Report**

Prepared for:

Hetronic 3905 NW 36th St. Oklahoma City, OK 73112 USA

By

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

1 May 2017

Reviewed by

Larry Finn Chief Technical Officer

Written by

Eric Lifsey EMC Engineer

### **Revision History**

Revision Number	Description	Date
DRAFT 2	Draft for review.	1 May 2017
01	Final	9 May 2017

Errata: none.

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# **Compliance Certificate**

Applicant	Device & Test Identification	
Hetronic	FCC ID:	LW9-MFSERGO120
3905 NW 36th St.	Industry Canada ID:	2119B-MFSERGO120
Oklahoma City, OK 73112 USA	Model(s):	MFS ERGO120
Certificate Date: 1 May 2017	Laboratory Project ID:	18583-15

The device named above was tested utilizing the following documents and found to be in compliance with the required criteria:

Requirement	Reference	Detail	
FCC 47 CFR Part 15 C	15.247	Operation within the bands 902-928 MHz, <u>2400-2483.5 MHz</u> , and 5725-5850 MHz.	
FCC 47 CFR Part 15 C	15.209	Radiated emission limits; general requirements.	
FCC 47 CFR Part 15 C	15.205	Restricted Bands of Operation	
KDB 558074 D01	DR01	DTS Measurement Guidance v03r02	
KDB 412172	D01	Guidelines for Determining the ERP and EIRP of an RF Transmitting System	
OET Bulletin 65*	Edition 97-01, and Supplement C, Ed. 01-01	Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields	
RSS-247	Issue 2	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence- Exempt Local Area Network (LE-LAN) Devices	
RSS-Gen	Issue 4	General Requirements and Information for the Certification of Radio Apparatus	
RSS-102	Issue 5 Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparat		

<sup>\*</sup>MPE is reported separately from this document. \*\*Corresponding RSS references are listed in the body of the report.

I, Eric Lifsey, for Professional Testing (EMI), Inc., being familiar with the above requirements and test procedures have reviewed the test setup, measured data, and this report. I believe them to be true and accurate.



This report has been reviewed and accepted by the Applicant. The undersigned is responsible for ensuring that this device will continue to comply with the requirements listed above.

Representative of Applicant

#### 1.0 Introduction

### 1.1 Scope

This report describes the extent to which the equipment under test (EUT) conformed to the intentional radiator requirements of the United States and Canada.

Professional Testing (EMI), Inc., (PTI) follows the guidelines of National Institute of Standards and Technology (NIST) for all uncertainty calculations, estimates, and expressions thereof for electromagnetic compatibility testing.

### 1.2 EUT Description

Table 1.2.1: Equipment Under Test				
Manufacturer / Model Serial # Description				
Hetronic Model: MFS ERGO120	none	2400-2483.5 MHz DTS transceiver; using Zigbee style protocol.		

Table 1.2.2: Support Equipment				
Manufacturer / Model Serial # Description				
None				

This device is a hand-held remote control for industrial systems such as cranes.

The device is powered by a lithium battery pack that is recharged in a separate charger.

The EUT is composed of a main board which contains the radio module being tested. Optional daughter boards can be populated for other radio bands and are tested separately. EUT is controlled by a variety of push buttons arranged on front and 3 sides. A USB connector is provided for factory programming of firmware.

The radio uses a monopole wire antenna bent to fit the space available.

### **1.3** EUT Operation

The EUT was exercised in a manner consistent with normal operations.

#### 1.4 Modifications to Equipment

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

#### 1.5 Test Site

Measurements were made at the PTI semi-anechoic facility designated Site 45 (FCC 459644, IC 3036B-1) in Austin, Texas. The site is registered with the FCC under Section 2.948 and Industry Canada per RSS-GEN, and is subsequently confirmed by laboratory accreditation (NVLAP). The test site is located at 11400 Burnet Road, Austin, Texas 78758, while the main office is located at 1601 North A.W. Grimes Boulevard, Suite B, Round Rock, Texas, 78665.

### 1.6 Radiated Measurements

Table 1.6 1 Measurement Corrections			
Parameter From Sums Of			
Radiated Field Strength Raw Measured Level + Antenna Factor + Cable Losses – Amplifier Gair			
Conducted Antenna Port Raw Measured Level + Attenuator Factor + Cable Losses			
Conducted Mains Port Raw Measured Level + LISN Factor + Cable/Filter/Limiter Losses			

Additionally, measurement distance extrapolation factors (such as 1/d above 30 MHz) are applied and documented where used.

### 1.7 Applicable Documents and Clauses

Table 1.7.1: Applicable Documents			
Document	Title		
47 CFR	Part 15 – Radio Frequency Devices		
47 CFK	Subpart C -Intentional Radiators		
RSS-247 Issue 2	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-		
N33-247 ISSUE 2	Exempt Local Area Network (LE-LAN) Devices		
RSS-Gen Issue 4 General Requirements and Information for the Certification of Radio Apparatus			
ANSI C63.10:2013	American National Standard of Procedures for Compliance Testing of Unlicensed		
ANSI C05.10.2013	Wireless Devices		

Table 1.7.2: Applicable Clauses					
Parameter	FCC Part 15 Rule Paragraphs	IC RSS References			
Transmitter Characteristics	15.247	RSS-247 5.2 (DTS) & 5.4, RSS-Gen			
Bandwidth	15.247(a)(1), 2.1049, KDB 558074 D01	RSS-Gen 4.6			
Spurious Emission	15.247, 15.209, 15.205	RSS-247 5.5, RSS-GEN 4.9, 4.10			
Band Edge	15.247, 15.205	RSS-247 5.5, RSS-Gen 4.9			
Antenna Requirement	15.247, 15.203	RSS-Gen 8.3			

#### 2.0 Fundamental Power

#### 2.1 Test Procedure

Peak power is measured using conducted means and with modulation.

#### 2.2 Test Criteria

47 CFR (USA) // IC (Canada)				
Section Reference	Date			
	Fundamental Power			
15.247(a)(3) //	Conducted Limits	7 Mar 2017		
RSS-247 5.2	1 W	/ IVIdI 201/		
	Limit Restated as Field: 125.23 dBμV/m @ 3 m			

#### 2.3 Test Results, Peak Power

The EUT was measured for radiated power at 3 meters.

Table 2.3.1 Power, Peak, Radiated Orientation Maximum: Flat Polarity Maximum: Horizontal				
Frequency MHz	Measured Peak Radiated Power in dBμV/m	Peak Power Restated in dBm	Peak Power Restated in mW	
2405	101.1	5.9	3.9	
2440	101.9	6.7	4.7	
2480	103.4	8.2	6.6	

Measured in 3 MHz RBW, 8 MHz VBW. Sweep triggered with max-hold.

Power setting 14 applied.

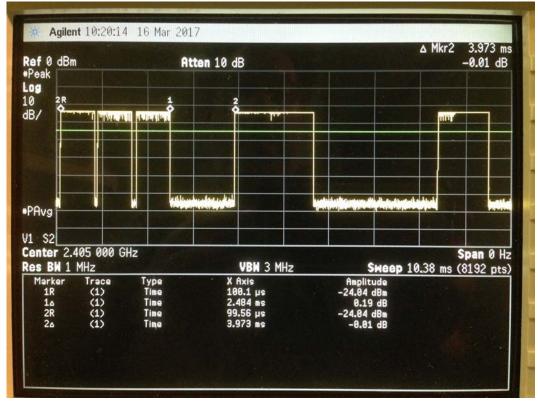
The EUT was satisfied the requirements.

### 2.4 Test Results, Duty Cycle

Measurement is based on intervals not to exceed 100 msec. Maximum transmitter on time is divided by the lesser of 100 msec or the actual measured minimum transmitter interval time. The result is converted to dB and applied as needed to peak measurements of transmitter artifacts to determine average power. This is not a pass/fail measurement.

Table 2.5.1 Duty Cycle Results and Average Duty Cycle Factor Result					
Total Measured On Time (msec)	Measured Time Interval (msec)	Duty Cycle Factor Calculation	Result (dB)	Duty Cycle Factor Allowed (dB)	
2.484	3.973	= 20 * Log <sub>10</sub> (2.484 msec / 3.973 msec )	-4.1	-4.1	

The allowed duty cycle factor is applied to peak measured harmonic signals to find average levels.



**Transmit Event & Time Interval** 

### 3.0 Power Spectral Density

#### 3.1 Test Procedure

A spectrum analyzer is either connected directly to the EUT or used by radiated means to measure the fundamental emission. It is adjusted to measure the power spectral density in the specified resolution bandwidth.

#### 3.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date
15.247(e) // RSS-247, 5.2	Power Spectral Density, Conducted Limit: 8 dBm / 3 kHz Restated as field strength limit: 103.23 dBμV/m at 3 m	14 Mar 2017

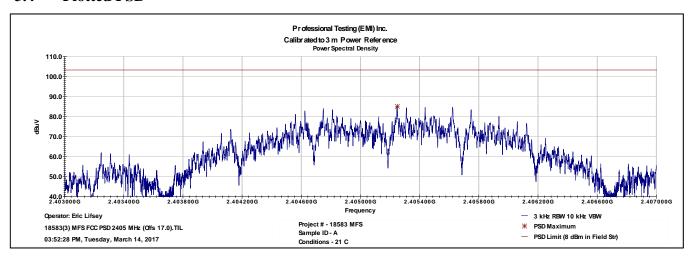
#### 3.3 Test Results

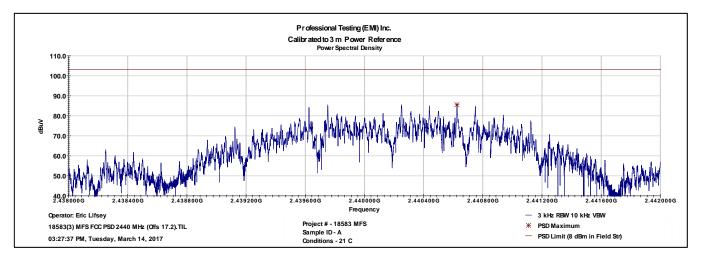
The highest channel when measured in full bandwidth exceeded 8 dBm. The measurement was taken calibrated relative to full power in a controlled environment.

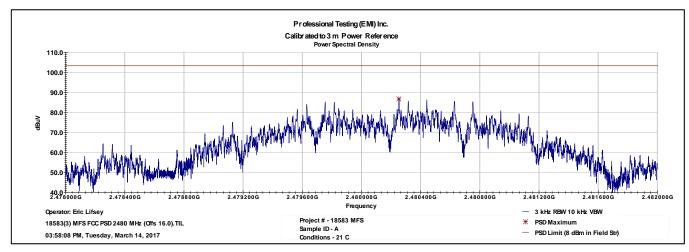
Table 3.3.1 Pow	Table 3.3.1 Power Spectral Density											
Frequency MHz	Measured Peak Radiated Power in dBµV/m	Peak Power Restated in dBm										
2405	85.0	-10.2										
2440	85.6	-9.6										
2480	86.7	-8.5										

Measured in 3 kHz RBW, 10 kHz VBW.

#### 3.4 Plotted PSD







## 4.0 Occupied Bandwidth

#### **4.1** Test Procedure

Bandwidth is measured by radiated means. A recording of the results is included.

#### 4.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
14.247(a)(2), 2.1049, KDB 558074 D01 // RSS-Gen 4.6	Bandwidth, 6 dB, 20 dB	14 Mar 2017

#### 4.3 Test Results

The bandwidth measurement is used to verify DTS characteristics and/or for general reporting for agency application.

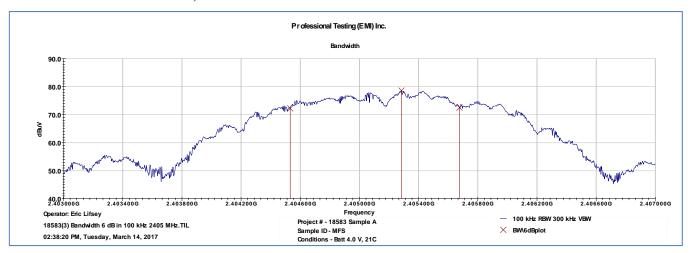
The EUT was found to be in compliance with applicable requirements.

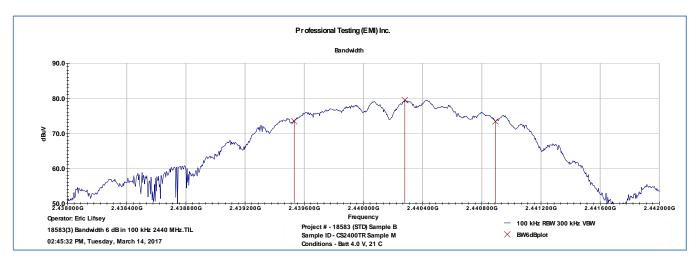
<b>Table 4.3.1</b>			
Bandwidth 6 dB	, Minimum 500 k	Hz in 100 kHz RBV	V
Low Channel Measured BW (kHz)	Mid Channel Measured BW (kHz)	High Channel Measured BW (kHz)	Reported Minimum BW (kHz)
1144	1360	1148	1144
Bandwidth 20 d	B, Measure and R	eport	
Low Channel Measured BW (kHz)	Mid Channel Measured BW (kHz)	High Channel Measured BW (kHz)	Reported Maximum BW (kHz)
2225	2272	2280	2280

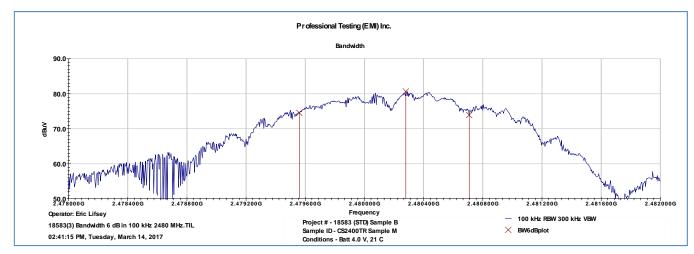
Plotted measurements appear on the following pages.

In cases where the software function failed to find/mark the correct edge of the modulated envelope, a manual measurement (marker-delta over display line) was taken with the same spectrum analyzer settings.

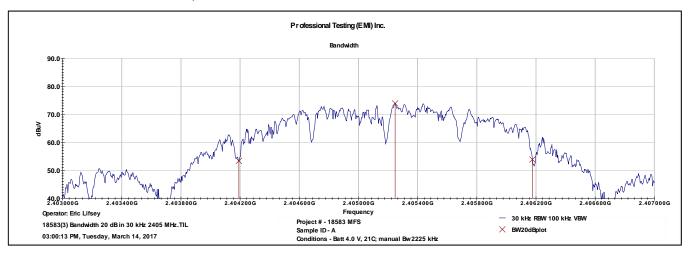
### 4.3.1 Bandwidth Plots, 6 dB

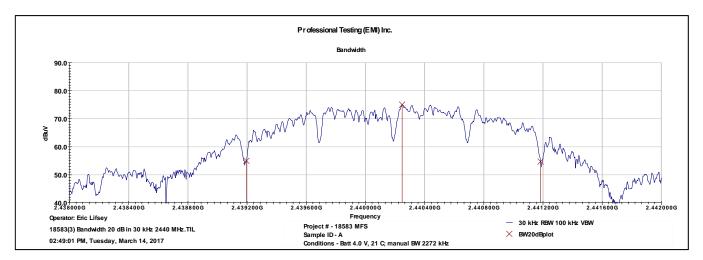


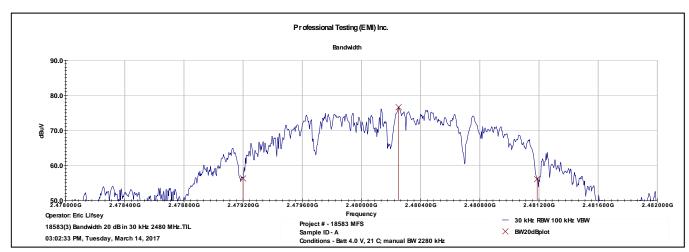




### 4.3.2 Bandwidth Plots, 20 dB







### 5.0 Band Edge

#### **5.1** Test Procedure

EUT is placed into normal transmit operation on the nearest band edge channel. The spectrum analyzer is approximately centered on the band edge frequency with span sufficient to include the peak of the adjacent fundamental signal. Measurement includes at least two standard bandwidths from the respective band edge. If required, the band-edge marker-delta method is utilized.

#### 5.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.247, 15.205 //	Unwanted Emissions Adjacent to Authorized	14 Mar 2017
RSS-247 5.5, RSS-Gen 4.9	Band	25 Apr 2017

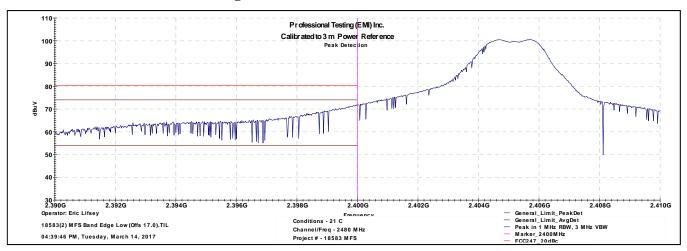
#### 5.3 Test Results

Measurements included fundamental and more than 2 standard bandwidths (standard bandwidth 1 MHz) beyond the band edges to provide a clear view of the fundamental and the declining emission levels.

Average levels were measured outside the band using 1 Hz video bandwidth.

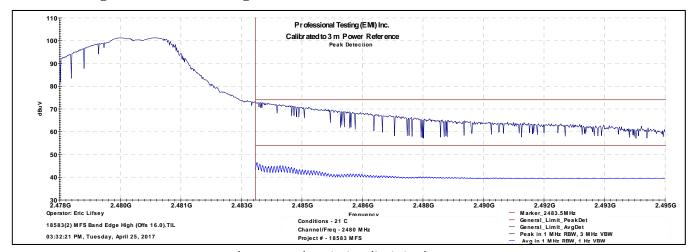
The EUT satisfied the criteria. Plotted results appear on the following pages.

### 5.3.1 Low Channel Band Edge



The 15.247 (-20 dBc) and general emission limits are shown.

### 5.3.2 High Channel Band Edge



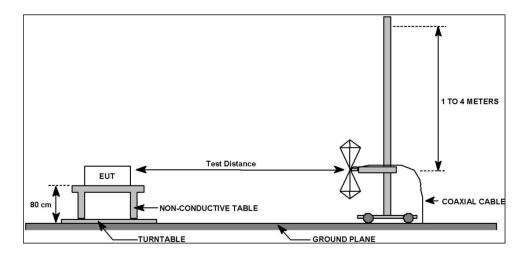
The general emission limit is shown.

### **6.0** Radiated Spurious Emissions, Transmit Mode

#### **6.1** Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The EUT was centered on a rotating turntable. Measurements below 1 GHz were taken at a test distance of 10 meters from the measurement antenna. Above 1 GHz the measurement distance was 3 meters.

Spurious emissions below 1 GHz were measured with quasi-peak detection with a resolution bandwidth of 120 kHz. Above 1 GHz peak measurements were taken and average measured where appropriate using 1 MHz resolution bandwidth. A diagram showing the test setup appears below.



#### 6.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.247, 15.209 // RSS-247 5.5, RSS-Gen 4.9 & 4.10	Field Strength of Radiated Spurious/Harmonic Emissions Transmit Mode	14 Mar 2017, 20 Mar 2017

#### **6.3** Test Results

## 6.3.1 Up to 1 GHz

(MHz)   (Meters)   (Degrees)   (Meters)   Function   (dBμV)   (dBμV/m)   (dBμVm)				Profess	sional Te	sting, El	VII, Inc.				
Section:   15.209   15.209   1.5209   1.5209   1.5209   1.000   1.5209   1.000   1.0	Test Metho	d:	ANSI C63.10:	2013							
Test Date(s):    Vertical   Frequency   Test   Mode   Margin   Mode   Margin   Mode   Margin   Margin		ice with:	Limits	209 - Code of	Federal Regulat	ions Part 47, S	Subpart C - In	tentional	Radiators,	Radiate	ed Emissions
Customer:			_					<u> </u>			
Project Number:   18583	•	):	<del>,                                    </del>						Sample B		
Purchase Order #: 0   Supervisor: Lisa Arndt								_			
Radiated Emissions Test Results Data Sheet   Page: 1 of 1	-		_					_			
Radiated Emissions Test Results Data Sheet   Page: 1 of 1						•		_	nat		
EUT Line Voltage: 3.8   VDC   EUT Power Frequency: 0   N/A	Equip. Una	er rest:	MFS ERGC	)120		witness N	ame:	None			
Frequency   Test   BUT   Distance   (Meters)   (Degrees)   (Meters)   (Degrees)   (Meters)   (Met		F	Radiated Em	issions Test	Results Data	Sheet			Page:	1	of 1
Frequency   Test   Margin (Meters)   Test Results (M	EUT Li	ne Voltage:	3	.8 VDC		EUT Pow	ver Frequer	ncy:	0	N/A	
Test   But   Direction   Height (Meters)   Detector (MHz)   Detector (MHz)   Direction (Meters)   Detector (Meters)   Detec	Antenna	Orientatio	n:	Vertic	al	Frequ	ency Range	:	30N	1Hz to	1GHz
Test   Distance   Distance   (Meters)   Direction   Height   (Meters)   Detector   Function   (Meters)   Detector   (Meters)   Detector   (Meters)   Direction   (Meters)   Detector   Direction   Direction   (Meters)   Detector   Direction   Detector		EUT N	lode of Ope	eration:			Tra	nsmit 2	440 MHz		
Measured (MHz)	F		<u> </u>			Danamalani					
95.2181 10 33 1.38 Quasi-peak 22.9 4.068 33.1 -29.0 Pass 166.909 10 63 2.17 Quasi-peak 22.6 7.173 33.1 -25.9 Pass 172.714 10 255 2.28 Quasi-peak 22.6 7.107 33.1 -26.0 Pass 558.287 10 357 4.07 Quasi-peak 22 17.687 35.6 -17.9 Pass 794.276 10 21 2.54 Quasi-peak 21.4 21.187 35.6 -14.4 Pass Professional Testing, EMI, Inc Radiated Emissions, 10m Distance 20 Quasi-peak 21.4 21.187 35.6 -14.4 Pass 21.4 21.187 21.4 21.187 21.4 21.187 21.4 21.187 21.4 21.187 21.4 21.18 21.18 21.4 21.18 21.4 21.18 21.18 21.4 21.18 21.4 21.18 21.18 21.4 21.18 21.4 21.18 21.18 21.4 21.18 21.18 21.4 21.18 21.18 21.4 21.18 21.18 21.4 21.18 21.18 21.18 21.18 21.4 21.18 21.18 21.18 21.18 21.18 21.18 21.18 21.18 21.18 21.18 21.18 21.18 21	Measured	Distance	Direction	Height		Amplitude	Level			_	Test Results
166.909 10 63 2.17 Quasi-peak 22.6 7.173 33.1 -25.9 Pass 172.714 10 255 2.28 Quasi-peak 22.6 7.107 33.1 -26.0 Pass 558.287 10 357 4.07 Quasi-peak 22 17.687 35.6 -17.9 Pass 794.276 10 21 2.54 Quasi-peak 21.4 21.187 35.6 -14.4 Pass Professional Testing, EMI, Inc Radiated Emissions, 10m Distance Radiated Emissions, 10m Distance Quasi-peak Value Verified Low-PRF QP Reading Corrected Peak Value Verified Low-PRF QP Reading LPRF Verification Limit Limit Spurious Tx ETSI 440 PROFESSIONAL TS TYPE PROFESSIONAL TS TYP	52.0849	10	59	1.78	Quasi-peak	23.5	3.345	29.	5 -2	26.2	Pass
172.714   10   255   2.28   Quasi-peak   22.6   7.107   33.1   -26.0   Pass	95.2181	10	33	1.38	Quasi-peak	22.9	4.068	33.:	1 -2	29.0	Pass
The image of the	166.909	10	63	2.17	Quasi-peak	22.6	7.173	33.:	1 -2	25.9	Pass
Professional Testing, EMI, Inc Radiated Emissions, 10m Distance 30MHz-1GHzVerticalPolarity Measured Emissions  00  10  10  10  10  10  10  10  10  1	172.714	10	255	2.28	Quasi-peak	_	7.107	33.:	1 -2	26.0	Pass
Professional Testing, EMI, Inc Radiated Emissions, 10m Distance 30MHz-1GHz Vertical Polarity Measured Emissions  Oussi-peak Limit Level Corrected Quasi-peak Reading Corrected Peak Value Verified Low-PRF QP Reading LPRF Verification Limit Limit Spurious Tx ETS1 440  PROFESSIONAL TESTING  AND ADDISONAL TESTING  PROFESSIONAL TESTING  ADDISONAL TESTING  PROFESSIONAL TESTING  ADDISONAL TESTING  PROFESSIONAL TESTING  PROFESSIONAL TESTING  ADDISONAL TESTING  PROFESSIONAL TESTING  PROFES	558.287	10	357	4.07	Quasi-peak	22	17.687	35.0	6 -1	L7.9	Pass
Professional Testing, EMI, Inc Radiated Emissions, 10m Distance 30MHz-1GHz Vertical Polarity Measured Emissions  60 LPRF Verification Limit Limit Spurious Tx ETSI '440  10  10  10  10  10  10  10  10  10	794.276	10	21	2.54	Quasi-peak	21.4	21.187	35.0	6 -1	L4.4	Pass
Operator: Eric Lifsey  18583 REMHz.til  03:01:26 PM, Tuesday, February 14,2017  Frequency Mode: STD Transmit 2440 MHz; MFS 2455+2480 MHz EUT sample B; module sample M Batt 3.8 V; Pos: flat  EUT: ERGO 120 (STD) Project Number: 18583 C lient: Hetronic	Field Strength (dB to V) (about 100 M) (below 18583.B)	r: Eric Lifsey E'M Hz.til		Mode: EUTsa	10 Fre STD Transmit 244 mple B; module sa	0 M	▽ C - C ▽ V × L - L	orrected Qu orrected Pe erified Low PRF Verific imit Spuriou EUT: ERG Project Nu	uasi-peak Rea ak Value -PRF QP Rea ation Limit us Tx ETSI '44	ding	X

#### Hetronic - MFS ERGO120 Professional Testing, EMI, Inc. Test Method: ANSI C63.10: 2013 FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions In accordance with: Limits 15.209 Section: Test Date(s): 2/14/2017 **EUT Serial #:** Item/Sample B EUT Part #: **Customer:** Hetronic None **Project Number:** 18583 Test Technician: **Eric Lifsey** Purchase Order #: Supervisor: Lisa Arndt MFS ERGO120 Witness' Name: **Equip. Under Test:** None of **Radiated Emissions Test Results Data Sheet** 1 Page: 1 **EUT Line Voltage:** 3.8 VDC **EUT Power Frequency:** 0 N/A **Antenna Orientation:** Horizontal **Frequency Range:** 30MHz to 1GHz **EUT Mode of Operation:** Transmit 2440 MHz Frequency Test EUT **Antenna** Recorded Corrected Detector Limit Level Margin Measured Distance Direction Height **Amplitude** Level **Test Results Function** $(dB\mu V/m)$ (dB) (MHz) (Meters) (Degrees) (Meters) (dBµV) (dBµV/m) 34.9402 3.44 23.4 11.77 -17.7 10 138 Quasi-peak 29.5 Pass 36.3154 238 Quasi-peak 23 -19.7 10 3.16 9.786 29.5 **Pass** 44.9096 10 64 2.49 Quasi-peak 24.3 7.97 29.5 -21.5 **Pass** 197.763 10 251 3.92 Quasi-peak 27.5 12.575 33.1 -20.5 Pass 432.085 10 296 3.9 Quasi-peak 23.6 16.022 35.6 -19.6 Pass 653.181 10 134 2.11 Quasi-peak 21.9 19.041 35.6 -16.6**Pass** 824.791 10 205 21.4 -14.3 2.55 Quasi-peak 21.285 35.6 Pass Quasi-peak Limit Level Professional Testing, EMI, Inc Radiated Emissions, 10m Distance 30MHz-1GHzHorizontalPolarity Measured Emissions Corrected Quasi-peak Reading Corrected Peak Value Verified Low-PRF OP Reading 60: LPRF V erification Limit **PROFESSIONAL** Limit Spurious Tx ETSI '440 50 Field Strength (dBµV/m) 40 30 20 100M 1G Frequency Mode: STD Transmit 2440 MHz; MFS 2455+2480 MHz EUT sample B; module sample M Batt 3.8 V; Pos: flat Operator: Eric Lifsey EUT: ERGO 120 (STD) 18583'RE'MHz.til Project Number: 18583

03:01:26 PM, Tuesday, February 14, 2017

Client: Hetronic

## 6.3.2 Up to 18 GHz

			Pro	ofess	sional Te	sting, El	MI, I	nc.					
Test Meth	od:	ANSI C63	3.10: 2013										
In accorda	nce with:	FCC Part Limits	15.209 - C	ode of I	ederal Regulat	ions Part 47,	Subpar	t C - Int	ention	al Radiat	ors, Radiato	ed Emis	ssions
Section:		15.209											
Test Date(	s):	2/14/2				EUT Serial				Sample	B B		
Customer:		Hetroni	ic			EUT Part #:			None				
Project Nu		18583				Test Techn			Eric Li				
Purchase (		0				Supervisor			Lisa A	rndt			
Equip. Und	der Test:	MFS E	RGO120			Witness' N	ame:		None				
	F	Radiated	l Emissior	ns Test	Results Data	Sheet				Page	e: 1	of	1
EUT I	ine Voltage	:	3.8	VDC		EUT Pov	ver Fr	equen	су:	0	N/A		
Antenn	a Orientatio	n:		Vertic	al	Frequ	ency I	Range:			Above 1	GHz	
	EUT N	/lode of	Operatio	n:			Т	ransm	it Mo	de 240	5 MHz		
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degree	on He	enna ight eters)	Detector Function	Recorded Amplitude (dBµV)	Le	ected vel .V/m)	Limit (dBµ\		Margin (dB)	Test F	Results
4811.39	3	54	3.	.06	Peak	55.5	51.	758	74	.0	-22.2	Pa	ass
7216.96	3	72	1.	.57	Peak	50.2	53.	084	74	.0	-20.9	Pa	ass
Radiate: 1-18 G Hz 90	ssional Testing, I Emissions, 3m Dis Vertical Polarity Meass	tance			Free	quency		▼ Corre  — Peak l  — Corre  — Limit !  △ COR	ge Limit Level cted A verag Limit Level cted Peak R Spurious Tx HORNY	e Reading eading ETSI '440 PKk			SSIONAL
Operator	: Eric Lifsey			Mode: MF	E transmit			E	OI: EKGO	140 MFS			

Professional Testing, EMI, Inc.  Test Method: ANSI C63.10: 2013  In accordance with:								пец	ronic – N	IL2 EV	30120
In accordance with:    FCC Part 15,209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits   Section:   15,209			Profess	sional Te	sting, EN	MI, Inc.	,				
Section: 15.209 Test Date(s): 2/14/2017	Fest Method: Al	NSI C63.10:	2013								
Test Date(s):  Z/14/2017  EUT Serial #: Item/Sample B  Customer: Hetronic	n accordance with:		09 - Code of F	ederal Regulat	ions Part 47, S	Subpart C - I	ntention	al Radiato	rs, Radiate	ed Emis	sions
Test Technician:   Eut Technician:   Eric Lifsey	Section: 15	5.209									
Project Number:   18583   Test Technician:   Eric Lifsey	Test Date(s): 2	/14/2017			EUT Serial	#:	ltem/	'Sample	В		
Purchase Order #: 0 Supervisor: Lisa Arndt Equip. Under Test: MFS ERGO120 Witness' Name: None  Radiated Emissions Test Results Data Sheet Page: 1 of 1  EUT Line Voltage: 3.8 VDC EUT Power Frequency: 0 N/A  Antenna Orientation: Horizontal Frequency Range: Above 1GHz  EUT Mode of Operation: Transmit Mode 2405 MHz  Frequency Test Direction (Degrees) (Meters) Direction (Meters) Punction (Meters) Punction (Meters) Punction (Meters) Punction (Meters) Peak 53.9 So.151 74.0 -23.8 Pass 77212.42 3 35 3.82 Peak 40 42.946 74.0 -31.0 Pass  Professional Testing, EMI, Inc Rodiated Emissions, 3m Distance 1-18GHz Horizontal Pokrity Measured Emissions Sm Distance	Customer: H	etronic			EUT Part #:						
Radiated Emissions Test Results Data Sheet  Radiated Emissions Test Results Data Sheet  Page: 1 of 1  EUT Line Voltage: 3.8 VDC  Antenna Orientation: Horizontal Frequency Range: Above 1GHz  EUT Mode of Operation: Transmit Mode 2405 MHz  Frequency Distance Direction (Meters) (Meters							_	•			
Radiated Emissions Test Results Data Sheet  Page: 1 of 1  EUT Line Voltage: 3.8 VDC  EUT Power Frequency: 0 N/A  Antenna Orientation: Horizontal Frequency Range: Above 1GHz  EUT Mode of Operation: Transmit Mode 2405 MHz  Frequency Test Direction (Degrees) (Meters) Punction (Meters)	_				•						
EUT Line Voltage: 3.8 VDC EUT Power Frequency: 0 N/A  Antenna Orientation: Horizontal Frequency Range: Above 1GHz  EUT Mode of Operation: Transmit Mode 2405 MHz  Frequency Test Distance (Inmit Level (Meters) Direction (Inmit Level (Meters) (Inmit Level (Inmit Inmit I	Equip. Under Test: N	MFS ERGO	120		Witness' N	ame:	None	!			
Antenna Orientation: Horizontal Frequency Range: Above 1GHz  EUT Mode of Operation: Transmit Mode 2405 MHz  Frequency Test Distance (Meters) Direction (Meters) Direction (Meters) (Me	Rad	diated Em	issions Test	Results Data	Sheet			Page:	1	of	1
EUT Mode of Operation:  Transmit Mode 2405 MHz  Frequency Test EUT Direction (Meters) Direction (Meters) Direction (Meters) (Degrees) (Meters) Punction (Meters) Punction (Meters) Punction (Meters) Punction (Meters) Punction (Meters) Peak 53.9 So.151 74.0 -23.8 Pass 7212.42 3 35 3.82 Peak 40 42.946 74.0 -31.0 Pass Poss 7212.42 3 35 3.82 Peak 40 42.946 74.0 -31.0 Pass Poss 7212.42 3 35 3.82 Peak 40 42.946 74.0 -31.0 Pass Poss 7212.42 3 35 3.82 Peak 40 42.946 74.0 -31.0 Pass Poss 74.0 Peak Init Level Corrected Average Reading Peak Init Level Corrected Average Reading Peak Init Level Corrected Average Reading Peak Reading Pe	<b>EUT Line Voltage:</b>	3.	8 VDC		EUT Pow	ver Freque	ency:	0	N/A		
Frequency Measured Distance (Meters) Direction (Degrees) (Meters) Professional Testing, EMI, Inc Rediated Emissions, 3m Distance 1-18 Gill Horizontal Pohnty Measured Emissions Professional Testing, EMI, Inc Rediated Emissions, 3m Distance 1-18 Gill Horizontal Pohnty Measured Emissions  Professional Testing, EMI, Inc Rediated Emissions Operators Retains Professional Testing, EMI, Inc Rediated Emissions, 3m Distance 1-18 Gill Horizontal Pohnty Measured Emissions  Professional Testing, EMI, Inc Rediated Emissions Operators Retains Professional Testing, EMI, Inc Rediated Emissions, 3m Distance 1-18 Gill Horizontal Pohnty Measured Emissions  Professional Testing, EMI, Inc Rediated Emissions Operators Retains Professional Testing, EMI, Inc Rediated Emissions Operators Retains Professional Testing, EMI, Inc Rediated Emissions Operators Retains Operators	Antenna Orientation:		Horizon	tal	Frequ	ency Rang	e:		Above 1	GHz	
Masured (Meters) Direction (Degrees) (Meters) Punction (dBµV) (dBµV/m) (dB	EUT Mo	de of Ope	ration:			Trans	mit Mo	de 2405	MHz		
Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1-18GHz Horizontal Polarity Measured Emissions  Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1-18GHz Horizontal Polarity Measured Emissions  PROFESSIONAL  COR HORNH PKK  PROFESSIONAL  STATE  Frequency  Frequency  EUT: ERGO 120 MFS 18583(3) 030717 RERun03 Spurious Rpt 240 2M0 7-18 GHz in EUT sample A  Froject Number: 18583	Measured Distance I	Direction	Height		Amplitude	Level	Limit		_	Test R	esults
Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1-18CH2 Horizontal Polarity Measured Emissions  90 80 80 80 80 80 90 10 80 80 80 80 80 80 80 80 80 80 80 80 80	4809.46 3	51	1.93	Peak	53.9	50.151	74	1.0	-23.8	Pa	SS
Professional Testing, EMI, Inc Radiated Emissions, 3m Distance  1-18 GHz Horizontal Polarity Measured Emissions  90 80 Corrected Average Reading Limit Spurious Tx ETSI '440 COR_HORNH_PKk  PROFESSIONAL  ESTIMA  COR_HORNH_PKK  185 S3(3) 030717 'RETun03 Spurious Rpt' 240 2M0'1-18 GHztal  EUT sample A  Mode: MFS transmit EUT sample A  Project Number: 18583	7212.42 3	35	3.82	Peak	40	42.946	74	1.0	-31.0	Pa	SS
	Radiated Emissions, 3m Distance 1-18GHz Horizontal Polarity Measu  90 80 80 60 60 82 30 40 20 1G Operator: Eric Lifsey 18583(3)030717 RERun03 Spurio	ce red Emissions	18GHz.til EUT sampl	S transmit e A		▼ Co — Pe — Co — Lii	orrected A vera; a k Limit Lev el orrected Pea k R mit Spurious Tx OR_HORNH_	ge Reading Reading RESTSI '440 PKK  10G 120 MFS siber: 18583			I N G
> 1GHz Horizontal Antenna Polarity Measured Emissions		> 1GI	Hz Horizont	al Antenna P	olarity Mea	sured Em	issions				

									П	etronic – iv	1FS ERGO12
			Profess	sional Te	sting, EN	ΛΙ, Ι	nc.				
Test Metho	d:	ANSI C63.10	: 2013								
In accordar	ice with:	FCC Part 15. Limits	209 - Code of F	ederal Regulat	ions Part 47, S	Subpar	t C - Into	entiona	l Radia	tors, Radiate	ed Emissions
Section:		15.209									
Test Date(s	):	2/14/2017			EUT Serial			Item/	Sampl	e B	
Customer:		Hetronic			EUT Part #:			None			
Project Nur		18583			Test Techni			Eric Li			
Purchase O		MES EDG	2120		Supervisor: Witness' N			Lisa A None	rnat		
Equip. Und	er rest.	MFS ERG	J120		Withess in	anne.		None			
	R	Radiated En	nissions Test	Results Data	a Sheet				Pag	e: 1	of 1
EUT Li	ne Voltage:	: 3	3.8 VDC		EUT Pow	ver Fre	equen	cy:	0	N/A	
Antenna	Orientatio	n:	Vertic	al	Frequ	ency F	Range:			Above 1	GHz
	EUT N	lode of Op	eration:			Т	ransm	it Moc	le 244	0 MHz	
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Le	ected vel V/m)	Limit l (dBμV		Margin (dB)	Test Result
4879.46	3	220	1.46	Peak	52.6	49.	074	74.	.0	-24.9	Pass
7319.14	3	59	1.47	Peak	49.5	52.	726	74.	.0	-21.2	Pass
Radiated	sional Testing, Emissions, 3m Diss ertical Polarity Measu	tance					<ul> <li>∇ Correct</li> <li>— Peak I</li> <li>— Correct</li> <li>— Limit S</li> </ul>	g e Limit Lev ted Averag Jimit Level ted Peak Re purious Tx HORNV_F	e Reading eading ETSI '440		PROFESSIONAL TESTING
Operator: 1	Eric Lifsey 30717'R E'R un04'Sp	urious Rnt' 2444 Ma	Mode: MF	'S transmit	quency			UT: ERGO	120 MFS		18G
	M, Monday, March	-	I-18GHz.til EUTsampl Batt 3.8 V					lient: Hetro			

> 1GHz Vertical Antenna Polarity Measured Emissions

#### Professional Testing, EMI, Inc. Test Method: ANSI C63.10: 2013 FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions In accordance with: Limits 15.209 Section: 2/14/2017 Item/Sample B Test Date(s): **EUT Serial #:** None **Customer:** Hetronic EUT Part #: **Eric Lifsey** 18583 **Project Number:** Test Technician: Lisa Arndt Purchase Order #: Supervisor: Witness' Name: **Equip. Under Test:** None MFS ERGO120 **Radiated Emissions Test Results Data Sheet** of 1 Page: 1 **EUT Line Voltage:** 3.8 VDC **EUT Power Frequency:** 0 N/A **Antenna Orientation:** Horizontal **Frequency Range: Above 1GHz EUT Mode of Operation: Transmit Mode 2440 MHz** EUT Recorded Frequency Test **Antenna** Corrected Detector Limit Level Margin Measured Distance Direction Height **Amplitude** Level **Test Results Function** (dBµV/m) (dB) (MHz) (Meters) (Degrees) (Meters) (dB<sub>µ</sub>V) (dBµV/m) 4881.45 3 297 1.66 43 39.527 74.0 -34.4 Peak Pass 7318.9 3 2.29 Peak 39.8 43.012 74.0 -30.9 Pass 51 - Average Limit Level Professional Testing, EMI, Inc ∇ Corrected Average Reading Radiated Emissions, 3m Distance Peak Limit Level 1-18 GHz Horizontal Polarity Measured Emissions Corrected Peak Reading Limit Spurious Tx ETSI '440 PROFESSIONAL COR HORNH PKk 80 Strength (dBµV/m) 70 F ie Id 30 18G Frequency Operator: Eric Lifsey EUT: ERGO 120 MFS 18583(3)°030717'RE'Run04'SpuriousRpt'2444M0'1-18GHztil EUT sample A 07:23:50 AM.Mondav,March 20, 2017 Batt 3.8 V; Pos: flat Project Number: 18583 07:23:50 AM, Monday, March 20, 2017 Client: Hetronic

> 1GHz Horizontal Antenna Polarity Measured Emissions

#### Professional Testing, EMI, Inc. Test Method: ANSI C63.10: 2013 FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions In accordance with: Limits 15.209 Section: 2/14/2017 Item/Sample B Test Date(s): **EUT Serial #:** None **Customer:** Hetronic EUT Part #: **Eric Lifsey** 18583 **Project Number:** Test Technician: Lisa Arndt Purchase Order #: Supervisor: Witness' Name: **Equip. Under Test:** None MFS ERGO120 **Radiated Emissions Test Results Data Sheet** of 1 Page: 1 **EUT Line Voltage:** 3.8 VDC **EUT Power Frequency:** 0 N/A **Antenna Orientation:** Vertical **Frequency Range: Above 1GHz EUT Mode of Operation: Transmit Mode 2480 MHz** EUT Recorded Frequency Test **Antenna** Corrected **Detector** Limit Level Margin Measured Distance Direction Height **Amplitude** Level **Test Results Function** (dBµV/m) (dB) (MHz) (Meters) (Degrees) (Meters) (dB<sub>µ</sub>V) (dBµV/m) 4959.75 3 218 1.83 51.5 48.266 74.0 -25.7 Peak Pass 7439.24 3 195 1.53 Peak 40.3 44.084 74.0 -29.9 Pass - Average Limit Level Professional Testing, EMI, Inc ∇ Corrected Average Reading Radiated Emissions, 3m Distance Peak Limit Level 1-18 GHz Vertical Polarity Measured Emissions Corrected Peak Reading Limit Spurious Tx ETSI '440 PROFESSIONAL COR HORNV PKk 80 Strength (dBµV/m) 70 F ie Id 30 18G 10G Frequency Operator: Eric Lifsey EUT: ERGO 120 MFS 18583(3)°030717'RE'Run05'SpuriousRpt'2480M0'1-18GHztil EUT sample A 08:20:27 AM.Mondav,March 20, 2017 Batt 3.8 V; Pos: flat Project Number: 18583 08:20:27 AM, Monday, March 20, 2017 Client: Hetronic

> 1GHz Vertical Antenna Polarity Measured Emissions

											ietron	IIC – IV	IFS ERG	3O120
			•	Profess	ional Te	sting, El	ΛΙ, Ι	nc.						
Test Metho	d:	ANSI C6	3.10:	2013										
In accordan	ice with:	FCC Part	t 15.2	09 - Code of F	ederal Regulat	tions Part 47, S	Subpar	t C - Int	entiona	ıl Radia	ators, F	Radiate	d Emis	sions
Section:		15.209												
Test Date(s	):	2/14/2	2017			EUT Serial	<b>#:</b>		Item/	Samp	le B			
Customer:		Hetron	nic			EUT Part #:			None					
Project Nur		18583				Test Techn			Eric Li					
Purchase O	-	0				Supervisor			Lisa A	rndt				
Equip. Und	er Test:	MFS	ERGO	0120		Witness' N	ame:		None					
	F	Radiate	d Em	issions Test	Results Data	a Sheet				Pag	ge:	1	of	1
EUT Li	ne Voltage:		3.	8 VDC		EUT Pow	er Fr	equen	су:	0	)	N/A		
Antenna	Orientatio	n:		Horizon	tal	Frequ	ency I	Range:			Abo	ove 10	GHz	
	EUT N	/lode of	Ope	ration:			Т	ransm	it Mod	de 248	30 MH	lz		
Frequency Measured (MHz)	Test Distance (Meters)	EU1 Directi (Degre	ion	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Le	ected vel .V/m)	Limit I (dBµ\		Maı (d	_	Test R	esults
4959.42	3	286	5	1.51	Peak	42.7	39.	516	74	.0	-34	1.4	Pa	SS
7438.89	3	342	2	2.25	Peak	38.9	42.	684	74	.0	-32	1.3	Pa	SS
Radiated 1-18GHzH 90	sional Testing, Emissions, 3m Dis Iorizontal Polarity Mo	tance						<ul><li>∇ Corre</li><li>— Peak I</li><li>— Corre</li><li>— Limit S</li></ul>	age Limit Leveted A verag Limit Level ected Peak R Spurious Tx _HORNH_1	e Reading eading ETSI '440			PROFES	
30 Gerator: 1	•	in a De 1994	I SAMA!	Mode: MF	S transmit	quency			UT: ERGO		<b>^</b>		18	G
	30717 RERun05 Sp AM, Monday, March	-	180M0'1-	18GHz.til EUT sampl Batt 3.8 V	le A				Project Num Client: Hetro		•			

> 1GHz Horizontal Antenna Polarity Measured Emissions

### 6.3.3 Up to 25 GHz

			Profes	sional Te	sting, EN	∕II, Inc.			
Test Metho	d:	ANSI C63.10:	2013						
In accordan	ce with:	FCC Part 15.2 Limits	09 - Code of	Federal Regulat	ions Part 47, S	Subpart C - Int	entional Radi	ators, Radiate	ed Emissions
Section:		15.209							
Test Date(s	):	2/14/2017			EUT Serial #	<b>‡</b> :	Item/Samp	le B	
Customer:		Hetronic			EUT Part #:		None		
Project Nur		18583			Test Techni	ician:	Eric Lifsey		
Purchase O	rder #:	0			Supervisor:		Lisa Arndt		
Equip. Und	er Test:	MFS ERGO	120		Witness' Na	ame:	None		
	F	tadiated Em	issions Tes	t Results Data	Sheet		Pa	ge: 1	of 1
	ne Voltage:		8 VDC		EUT Pow	er Frequen	cy: (	N/A	
Antenna	Orientatio	n:	Vertic	al	Freque	ency Range:		Above 1	GHz
	EUT N	lode of Ope	ration:		Tr	ansmit Mod	de 2405 MH	z & 2480 M	Hz
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results
4806.19	3	131	3.88	Peak	42.2	38.52	74.0	-35.4	Pass
4960.16	3	92	3.30	Peak	44.6	41.37	74.0	-32.6	Pass
7206.38	3	55	2.38	Peak	38.4	41.33	74.0	-32.6	Pass
7439.71	3	9	1.42	Peak	39.4	43.11	74.0	-30.9	Pass
9605.33	3	279	2.25	Peak	36.8	44.86	74.0	-29.1	Pass
9918.14	3	72	2.16	Peak	35.6	43.49	74.0	-30.5	Pass
12008.3	3	68	3.44	Peak	36.0	46.35	74.0	-27.6	Pass
12402.3	3	162	2.47	Peak	37.4	48.18	74.0	-25.8	Pass
Profe Radiate 18-26.5 90 80 70 80 70 80 80 80 80 80 80 80 80 80 80 80 80 80	ssional Tes d Emissions, GHz Vertical Po	sting, EMI, Measured at 1 a rity Measured I	Inc m and Scaled emissions	to 3m Distance		<ul><li>∇ Co</li><li>— Per</li><li>— Co</li></ul>	erage Limit Leve rrected Average ak Limit Level rrected Peak Rea DR_KHORNV_	R ea ding	PROFESSIONAL TESTING
30 = -			V	_		<b>V</b>		_ 🔻 📗	
18583(2	18.70 G r: Eric Lifsey 405+2480)ghz 3 PM, Wednesda	19.40 G til y, April 26, 2017	EUT sa	Free MFS transmit (Bot	50G 22.20 quency &Top Chan)	I I	G 23.60G EUT: ERGO 120 Project Number: Client: Hetronic		25.00G

			Profess	sional Te	sting, EN	VII, Inc.				
Test Metho	od:	ANSI C63.10:	2013							
In accordance with: FCC Part 15.209 - Code of Federal Regulat				ions Part 47, S	Subpart C - Int	tentional Radi	ators, Radiate	ed Emissions		
Section:		15.209								
Test Date(s	s):	2/14/2017			EUT Serial	#:	Item/Samp	le B		
Customer:		Hetronic			EUT Part #:		None			
Project Nu	mber:	18583			Test Techni	ician:	Eric Lifsey	sey		
Purchase C	rder #:	0			Supervisor:		Lisa Arndt			
Equip. Und	er Test:	MFS ERGO	120		Witness' Na	ame:	None			
	F	adiated Em	issions Test	Results Data	a Sheet		Pa	ge: 1	of 1	
EUT L	ne Voltage:	3.	.8 VDC		EUT Pow	ver Frequen	cy: (	N/A		
Antenna	orientation of the contraction o	n:	Horizor	ntal	Frequ	ency Range:	:	Above 1	GHz	
	EUT N	lode of Ope	eration:		Tr	ansmit Mod	de 2405 MH	z & 2480 M	lHz	
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBμV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results	
4800.38	3	134	3.72	Peak	41.2	37.426	74.0	-36.5	Pass	
4959.86	3	315	1.18	Peak	41.8	38.588	74.0	-35.4	Pass	
7205.19	3	316	1.91	Peak	38.8	41.67	74.0	-32.3	Pass	
7434.46	3	258	3.62	Peak	38.3	42.003	74.0	-32.0	Pass	
9612.81	3	345	1.02	Peak	35.1	43.145	74.0	-30.8	Pass	
9918.42	3	319	3.13	Peak	36.5	44.365	74.0	-29.6	Pass	
12013.4	3	108	1.37	Peak	36.6	46.977	74.0	-27.0	Pass	
12402.5	3	44	2.76	Peak	36	46.707	74.0	-27.3	Pass	
Professional Testing, EMI, Inc Radiated Emissions, Measured at 1m and Scaled to 3m Distance 18-26.5 GHz Horizontal Polarity Measured Emissions  90 80 70						<ul><li>∇ Co</li><li>— Per</li><li>— Co</li></ul>	erage Limit Level prected Average ak Limit Level prected Peak Rea DR_KHORNH_1	R ea ding	PROFESSIONAL TESTING	
18583(	18.70G r: Eric Lifsey 2405+2480)ghz. 3 PM, Wednesda	19.40G til ty,April 26,2017	EUT san	Fred MFS transmit (Bot	550G 22.20 quency &Top Chan)	]	G 23.60G EUT: ERGO 120 Project Number: Client: Hetronic		25.00 G	

							l	Hetronic – N	1FS ERGO120	
			Profess	sional Te	sting, El	VII, Inc.				
Test Method: ANSI C63.10: 2013										
In accordan	ice with:	FCC Part 15 Limits	.209 - Code of I	ederal Regulat	ions Part 47,	Subpart C - Int	tentional Radi	ators, Radiate	ed Emissions	
Section:		15.209								
Test Date(s	):	2/14/2017	7		EUT Serial		Item/Samp	le B		
Customer:		Hetronic			EUT Part #:		None			
Project Nur		18583			Test Techn		Eric Lifsey			
Purchase O		0			Supervisor		Lisa Arndt			
Equip. Und	er Test:	MFS ERGO	0120		Witness' N	ame:	None			
	F	Radiated E	missions Test	Results Data	a Sheet		Pa	ge: 1	of 1	
EUT Li	ne Voltage:	:	3.8 VDC		EUT Pov	ver Frequen	icy:	N/A		
Antenna	Orientatio	n:	Vertic	al	Frequ	ency Range		Above 1	bove 1GHz	
	EUT N	lode of Op	eration:			Transm	nit Mode 24	40 MHz		
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results	
19515.6	3	378	1	Peak	39.9	34.002	74.0	-40.0	Pass	
21954.6	3	66	1	Peak	42.7	37.156	74.0	-36.8	Pass	
24385.4	3	321	1	Peak	44.9	40.938	74.0	-33.0	Pass	
Professional Testing, EMI, Inc Radiated Emissions, Measured at 1m and Scaled to 3m Distance  18-26.5 GHz VerticalPolarity Measured Emissions  90  80  Corrected Average Reading  Peak Limit Level  Corrected Peak Reading  COR_KHORNV_PKk  PROFESSIONAL  FESTINE  30  PROFESSIONAL  FESTINE  Average Limit Level  Corrected Average Reading  Peak Limit Level  Corrected Peak Reading  Average Limit Level  Corrected Average Reading  PROFESSIONAL  FESTINE  Average Limit Level  Corrected Average Reading  Peak Limit Level  Corrected Peak Reading  Average Limit Level  Description of the peak Limit Level  Corrected Average Reading  Peak Limit Level  Corrected Peak Reading  Average Limit Level  Description of the peak Limit Level  Corrected Peak Reading  Average Limit Level  Description of the peak Limit Level  Corrected Peak Reading  Average Limit Level  Description of the peak Limit Level  Corrected Average Reading  Peak Limit Level  Corrected Peak Reading  Average Limit Level  Description of the peak Limit Level  Corrected Average Reading  Peak Limit Level  Corrected Peak Reading  Average Limit Level  Corrected Average Reading  Peak Limit Level  Corrected Peak Reading  Average Limit Level  Description of the peak Limit Level  Corrected Peak Reading  Peak Limit Level  Corrected Peak Reading  Average Limit Level  Description of the peak Limit Level  Corrected Peak Reading  Peak Limit Level  Corrected Peak Readi										
18583(2	18.70 G r: Eric Lifsey 440)g hz.til 9 PM, Wednesda	19.40G	Mode: I EUT sai	Free MFS transmit	50G 22.20 quency	] ]	G 23.60G EUT: ERGO 120 Project Number: Client: Hetronic		25.00 G	

> 1GHz Vertical Antenna Polarity Measured Emissions

#### Professional Testing, EMI, Inc. Test Method: ANSI C63.10: 2013 FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions In accordance with: Limits 15.209 Section: 2/14/2017 Test Date(s): EUT Serial #: Item/Sample B None EUT Part #: **Customer:** Hetronic 18583 **Eric Lifsey Project Number:** Test Technician: Lisa Arndt Purchase Order #: Supervisor: **Equip. Under Test:** MFS ERGO120 Witness' Name: None **Radiated Emissions Test Results Data Sheet** of 1 Page: 1 **EUT Line Voltage:** 3.8 VDC **EUT Power Frequency:** 0 N/A **Antenna Orientation:** Horizontal **Frequency Range: Above 1GHz EUT Mode of Operation: Transmit Mode 2440 MHz** Frequency Test EUT **Antenna** Recorded Corrected Detector Limit Level Margin Measured Distance Direction Height Amplitude Level **Test Results Function** (dBµV/m) (dB) (MHz) (Meters) (Degrees) (Meters) (dB<sub>µ</sub>V) (dBµV/m) 4883.36 3 26 2.63 42.4 38.933 74.0 -35.0 Peak **Pass** 7315.35 3 Peak 38.6 41.784 74.0 -32.2 Pass 123 1.63 9762.07 44.784 74.0 -29.2 3 318 2.63 Peak 37 Pass — Average Limit Level Professional Testing, EMI, Inc Radiated Emissions, Measured at 1m and Scaled to 3m Distance 18-26.5 GHz Horizontal Polarity Measured Emissions Corrected Average Reading Peak Limit Level 90 Corrected Peak Reading PROFESSIONAL COR\_KHORNH\_PKk 80 Field Strength (dBµV/m) 70 60 50 40 30 20+---18.00 G 18.70G 19.40G 20.10G $20.80\,G$ 21.50G 22.20G 22.90G 23.60G 24.30G $25.00\,G$ Operator: Eric Lifsey EUT: ERGO 120 MFS Frequency Mode: MFS transmit 18583(2440)ghz.til Project Number: 18583 EUT sample A Batt 3.8 V; Pos: flat 01:38:39 PM, Wednesday, April 26, 2017 Client: Hetronic

> 1GHz Horizontal Antenna Polarity Measured Emissions

### **7.0** Antenna Construction Requirements

#### 7.1 Procedure

A direct examination of the antenna construction is performed and compared to rule criteria that prevent wireless device antennas from being modified by end users.

#### 7.2 Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.203, 15.247 // RSS-Gen 8.3	Antenna Construction	25 Apr 2017

### 7.3 Results

#### **Table 8.3.1 Antenna Construction Details**

#### **On-Board Wire Antenna**

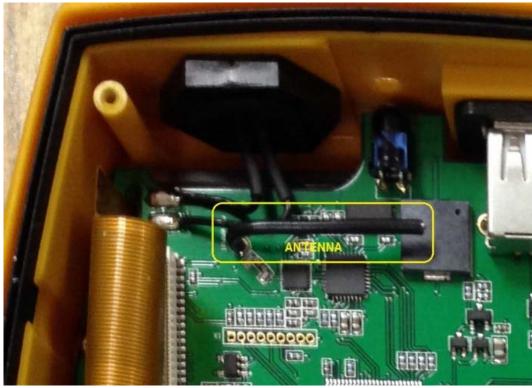
Manufacturer: Hetronic

Model/PN:

Type: monopole, bent wire

Gain 0.0 dBi

Soldered to circuit board, internal to system, and not subject to user modification.



**Antenna Location / Construction Detail** 

The antenna system design above satisfies the requirements of the rules.

## 8.0 Equipment

### 8.1 Radiated Emissions 30 MHz to 25 GHz

Tile! Software Version: 4.2.A			May 23, 2010, 08:38:52 AM					
	Test Profile: 2016 RE_ClassA - Boresite+Mast_LowPRF_072616.til or 2016 RE_ClassB - Boresite+Mast_LowPRF_072616.til							
Asset #	t # Manufacturer Model		Equipment Nomenclature	Serial Number	Calibration Due Date			
1509A	Braden	N/A	TDK 10M Chamber, NSA < 1 GHz	DAC-012915-005	7/10/2017			
1937	Agilent	E4440A	Spectrum Analyzer, 3 Hz - 26.5 GHz, Opt. AYZ	MY44808298	11/15/2017			
2172	ETS-Lindgren	3142C	Antenna, Biconilog, 26 MHz-3GHz	49383	11/27/2018			
C027D	PTI	None	Relay	none	N/A			
1327	EMCO	1050	Controller, Antenna Mast	none	N/A			
0942	EMCO	11968D	Turntable, 4ft.	9510-1835	N/A			
1969	HP	11713A	Attenuator/Switch Driver	3748A04113	N/A			
1509B	Braden	N/A	TDK 10M Chamber, VSWR > 1 GHz	DAC-012915-005	6/19/2017			
2004	Miteq	AFS44-00101800- 2S-10P-44	Amplifier, 40dB, .1-18GHz	0	1/11/2018			
C030	none	none	Cable Coax, N-N, 30m	none	10/1/2017			
1325	EMCO	1050	Controller, Antenna Mast	9003-1461	N/A			
1780	ETS-Lindgren	3117	Antenna, Double Ridged Guide Horn, 1 - 18 GHz	110313	3/15/2019			
1542	A.H. Systems	SAS-572	Antenna, Horn 18-26.5GHz, 20dB gain	225	11/20/2018			
1973	Agilent	83017A	Amplifier, Microwave 0.5-26.5 GHz	MY39500497	11/17/2018			

## 8.2 Bandwidth, Duty Cycle, Band Edge

Asset #	Manufacturer	Model #	Description	Calibration Due
2295	Agilent	E4440A	Spectrum Analyzer	30 Sep 2017
1831	НР	6622A	Power Supply	CIU
0472	Tektronix	THS730A	DMM/Scope	15 Nov 2017
C241	Pasternack	PE300-120	RG type cable	21 Jan 2018
None	ETS	5211	Shielded Enclosure	CIU
None	PTI	None	2 GHz Sleeve Sense Antenna	CIU

### 9.0 Measurement Bandwidths

Radiated Emissions Spectrum Analyzer Bandwidth and Measurement Time - Peak Scan						
Frequency Band Start (MHz)	Frequency Band Stop (MHz)	6 dB Bandwidth (kHz)	Number of Ranges Used	Measurement Time per Range		
0.009	0.15	0.3	2	Multiple Sweeps		
0.15	30	9	6	Multiple Sweeps		
30	1000	120	2	Multiple 800 mS Sweeps		
1000	6000	1000	2	Multiple Sweeps		
6000	18000	1000	2	Multiple Sweeps		
18000	26500	1000	2	Multiple Sweeps		

#### \*Notes:

<sup>1.</sup> The settings above are specifically calculated for the E4440A series of spectrum analyzers, which have 8,000 data points per range.

<sup>2.</sup> The measurement receiver resolution bandwidth setting was 300 Hz for quasi-peak measurements from 9-150 kHz.

<sup>3.</sup> The measurement receiver resolution bandwidth setting was 9 kHz for quasi-peak measurements from 0.15-30 MHz.

<sup>4.</sup> The measurement receiver resolution bandwidth setting was 120 kHz for quasi-peak measurements from 30-1000 MHz.

<sup>5.</sup> The measurement receiver resolution bandwidth setting was 1 MHz for average measurements from 1-18 GHz.

#### Appendix: Policy, Rationale, and Evaluation of EMC Measurement Uncertainty

All uncertainty calculations, estimates and expressions thereof shall be in accordance with NIST policy. Since PTI operates in accordance with NIST (NVLAP) Handbook 150-11: 2007, all instrumentation having an effect on the accuracy or validity of tests shall be periodically calibrated or verified traceable to national standards by a competent calibration laboratory. The certificates of calibration or verification on this instrumentation shall include estimates of uncertainty as required by NIST Handbook 150-11.

#### 1. Rationale and Summary of Expanded Uncertainty.

Each piece of instrumentation at PTI that is used in making measurements for determining conformance to a standard (or limit), shall be assessed to evaluate its contribution to the overall uncertainty of the measurement in which it is used. The assessment of each item will be based on either a type A evaluation or a type B evaluation. Most of the evaluations will be type B, since they will be based on the manufacturer's statements or specifications of the calibration tolerances, or uncertainty will be stated along with a brief rationale for the type of evaluation and the resulting stated uncertainties.

The individual uncertainties included in the combined standard uncertainty for a specific test result will depend on the configuration in which the item of instrumentation is used. The combination will always be based on the law of propagation of uncertainty. Any systematic effects will be accommodated by including their uncertainties, in the calculation of the combined standard uncertainty; except that if the direction and amount of the systematic effect cannot be determined and separated from its uncertainty, the whole effect will be treated as uncertainty and combined along with the other elements of the test setup.

Type A evaluations of standard uncertainty will usually be based on calculating the standard deviation of the mean of a series of independent observations, but may be based on a least-squares curve fit or the analysis of variance for unusual situations. Type B evaluations of standard uncertainty will usually be based on manufacturer's specifications, data provided in calibration reports, and experience. The type of probability distribution used (normal, rectangular, a priori, or u-shaped) will be stated for each Type B evaluation.

In the evaluation of the uncertainty of each type of measurement, the uncertainty caused by the operator will be estimated. One notable operator contribution to measurement uncertainty is the manipulation of cables to maximize the measured values of radiated emissions. The operator contribution to measurement uncertainty is evaluated by having several operators independently repeat the same test. This results in a Type A evaluation of operator-contributed measurement uncertainty.

A summary of the expanded uncertainties of PTI measurements is shown as Table 1. These are the worst-case uncertainties considering all operative influence factors.

**Table 1: Summary of Measurement Uncertainties for Site 45** 

Type of Measurement	Frequency Range	Meas. Dist.	Expanded Uncertainty U, dB (k=2)
Mains Conducted Emissions	150 kHz to 30 MHz	N/A	2.9
Telecom Conducted Emissions	150 kHz to 30 MHz	N/A	2.8
Padiated Emissions	30 to 1,000 MHz	10 m	4.8
Radiated Emissions	1 to 18 GHz	3 m	5.7

End	Λf	Rei	nort	
Lillu	VI.	1/6	սու	

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