

Advanced  
Compliance Laboratory

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**ELECTROMAGNETIC EMISSION COMPLIANCE REPORT**  
of  
CLIMATE LOGIC  
MODEL: CL-M1  
FCC ID: OF7CL9  
January 25, 2011

This report concerns (check one): Original grant  Class II change   
Equipment type: Low Power Intentional Radiator

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? yes  no   
If yes, defer until: \_\_\_\_\_ (date)  
Company agrees to notify the Commission by \_\_\_\_\_ (date)  
of the intended date of announcement of the product so that the grant can be  
issued on that date.

Transition Rules Request per 15.37? yes  no   
If no, assumed Part 15, Subpart B for unintentional radiators - the new 47 CFR  
[10-1-90 Edition] provision.

Report prepared for: THE TORO COMPANY  
Report prepared by: Advanced Compliance Lab  
Report number: 0048-101130-03-FCC



Lab Code: 200101 The test result in this report IS supported and covered by the NVLAP accreditation

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## 1. GENERAL INFORMATION

### 1.1 Verification of Compliance

EUT: CLIMATE LOGIC  
Model: CL-M1  
Applicant: THE TORO COMPANY  
Test Type: FCC Part 15C CERTIFICATION  
Result: PASS  
Tested by: ADVANCED COMPLIANCE LABORATORY  
Test Date: 11/30/2010 - 01/24/2011  
Report Number: 0048-101130-03-FCC

The above equipment was tested by Compliance Laboratory, Advanced Technologies, Inc. for compliance with the requirement set forth in the FCC rules and regulations Part 15 subpart C. This said equipment in the configuration described in the report, shows the maximum emission levels emanating from equipment are within the compliance requirements.



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Wei Li  
Lab Manager  
Advanced Compliance Lab

Date January 25, 2011

## **1.2 Equipment Modifications**

N/A

### 1.3 Product Information

#### System Configuration

ITEM	DESCRIPTION	FCC ID	CABLE
Product	CLIMATE LOGIC (1)	OF7CL9	
Housing	PLASTICS		
Power Supply	(1) 9V DC Battery (2) AC-DC adapter, I/P:120Vac, O/P:9Vdc		
Operation Freq.	906MHz ~ 922MHz		
Receiver	CL-M1(RX)	Verification	

(1) EUT submitted for grant.

### 1.4 Test Methodology

Radiated tests were performed according to the procedures in ANSI C63.4-2003 at an antenna to EUT distance of 3 meters.

### 1.5 Test Facility

The open area test site and conducted measurement facility used to collect the radiated and conducted data are located at Hillsborough, New Jersey. This site has been accepted by FCC to perform measurements under Part 15 or 18 in a letter dated May 19, 1997 (Refer to: 31040/PRV 1300F2). The NVLAP Lab code for accreditation of FCC EMC Test Method is: 200101-0.

### 1.6 Test Equipment

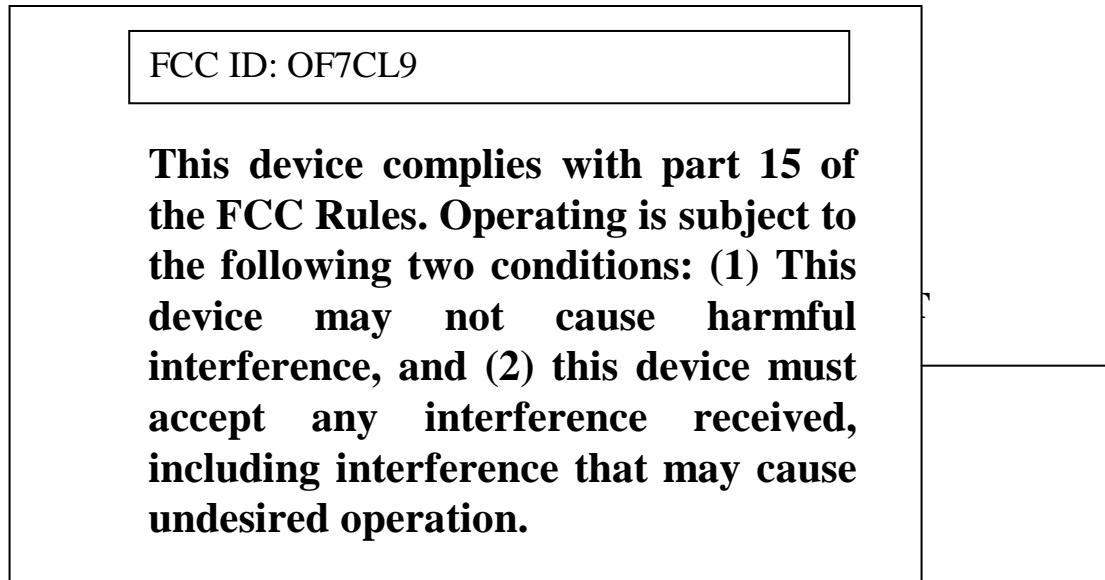
Manufacture	Model	Serial No.	Description	Cal Due dd/mm/yy
Hewlett-Packard	HP8546A	3448A00290	EMI Receiver	25/09/11
Agilent	E4440A	US40420700	3Hz-26.5GHz Spec. Analyzer	17/06/12
EMCO	3104C	9307-4396	20-300MHz Biconical Antenna	19/10/11
EMCO	3146	9008-2860	200-1000MHz Log-Periodic Antenna	19/10/11
Fischer Custom	LISN-2	900-4-0008	Line Impedance Stabilization Networks	05/10/11
Fischer Custom	LISN-2	900-4-0009	Line Impedance Stabilization Networks	18/10/11
EMCO	3115	4945	Double Ridge Guide Horn Antenna	17/10/11

All Test Equipment Used are Calibrated Traceable to NIST Standards.

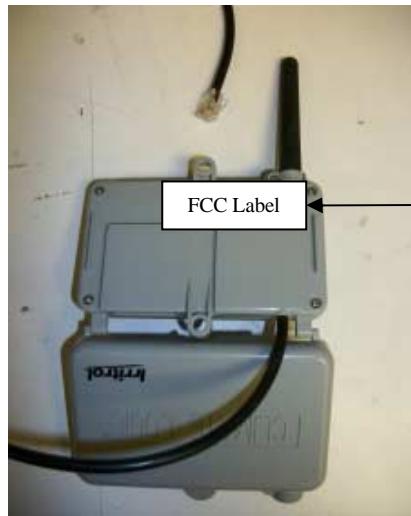
### **1.7 Statement for the Document Use**

This report shall not be reproduced except in full, without the written approval of the laboratory. And this report must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

## 2. PRODUCT LABELING



**Figure 2.1 FCC ID Label  
(Only FCC ID shown on EUT)**



**Figure 2.2 FCC Label Location**

### **3. SYSTEM TEST CONFIGURATION**

#### **3.1 Justification**

The system was configured for testing in a typical fashion (as a customer would normally use it). And its antenna was permanently attached to the EUT with max length, 3".

Testing was performed as EUT was continuously operated at the following frequency channels:

**Low=906MHz, Middle= 914MHz, High=922MHz.**

Fresh external battery was used for extended operating time.

#### **3.2 Special Accessories**

N/A

#### **3.3 Configuration of Tested System**

Figure 3.1 illustrate this system, which is tested standing along.



**Figure 3.1 Radiated Test Setup**



**Figure 3.2 Conducted Setup- Front**



**Figure 3.3 Conducted Setup- Rear**

## **4. SYSTEM SCHEMATICS**

**See Attachment.**

**Figure 4.1 System Schematics**

## 5. CONDUCTED EMISSION DATA

### 5.1 Test Methods and Conditions

The EUT was under normal operational mode during the conducted emission test. EMI Receiver was scanned from 150KHz to 30MHz with maximum hold mode for maximum emission. Recorded data was sent to the plotter to generate output in linear format. At the input of the spectrum analyzer, a HP transient limiter is inserted for protective purpose. This limiter has a 10 dB attenuation in the range of 150KHZ to 30MHZ. That factor was automatically compensated by the receiver, so the readings are the corrected readings. The reference of the plot is the CISPR 22 Class B limit in Figure 5.1 through Figure 5.2.

Conducted Emission Technical Requirements				
Frequency Range	Class A		Class B	
	Quasi-Peak dBuV	Average dBuV	Quasi-Peak dBuV	Average dBuV
150kHz -0.5MHz	79 (8912uV)	66 (1995uV)	66-56	56-46
0.5MHz-30MHz	73 (4467uV)	60 (1000uV)	---	---
0.5MHz- 5MHz	---	---	56	46 (250uV)
5MHz-30MHz	---	---	60	50

Emissions that have peak values close to the specification limit (if any) are also measured in the quasi-peak mode to determine compliance.

### 5.2 Test Data

Figure 5.1-5.2 show the neutral and line conducted emissions for the standard operation.

Highest Data for AC Line Conducted Emissions					
Frequency (MHz)	0.15	0.16	0.18	0.4	0.41
Peak Reading (dBuV)	42.6	41.7	41.5	39.4	37.9
Average Reading (dBuV)					

Test Personnel:



Tester Signature: \_\_\_\_\_

Typed/Printed Name: Edward Lee

Date: January 25, 2011

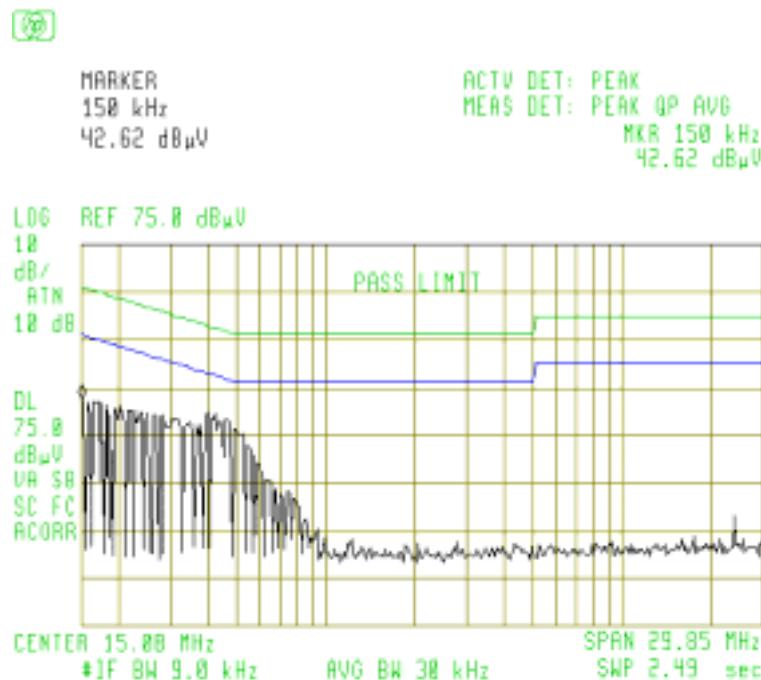


Fig. 5.1 Conducted Emission-Line

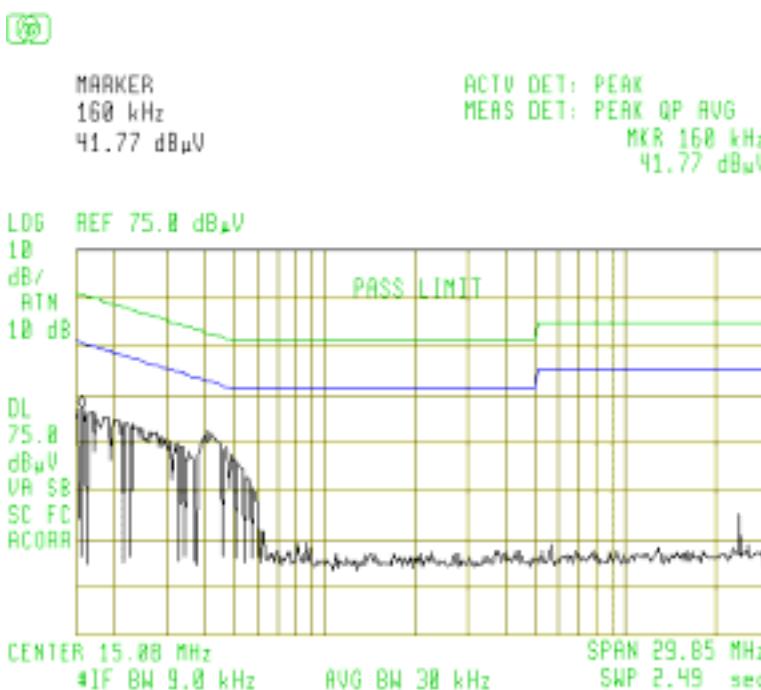


Fig. 5.2 Conducted Emission- Neutral

## 6. RADIATED EMISSION DATA

### 6.1 Field Strength Calculation

The corrected field strength is automatically calculated by EMI Receiver using following:

$$FS = RA + AF + CF + AG$$

where FS: Corrected Field Strength in dB $\mu$ V/m

RA: Amplitude of EMI Receiver before correction in dB $\mu$ V

AF: Antenna Factor in dB/m

CF: Cable Attenuation Factor in dB

AG: Built-in Preamplifier Gain in dB (Stored in receiver as part of the calibration data)

THE "DUTY CYCLE CORRECTION FACTOR" FOR SPURIOUS RADIATED EMISSIONS IS;  
 $20 \log^* (23.8 \text{ ms} / 100 \text{ ms}) = -12.5 \text{ dB}$ , WHICH WAS USED TO CORRECT THE AVERAGE RADIATED EMISSION READINGS.

### 6.2 Test Methods and Conditions

The initial step in collecting radiated data is a EMI Receiver scan of the measurement range below 30MHz using peak detector and 9KHz IF bandwidth / 30KHz video bandwidth. For the range 30MHz - 1GHz, 100KHz IF bandwidth / 100KHz video bandwidth are used. Both bandwidths are 1MHz for above 1GHz measurement. Up to 10<sup>th</sup> harmonics were investigated.

### 6.3 Test Data

The following data lists the significant emission frequencies, polarity and position, peak reading of the EMI Receiver, the FCC limit, and the difference between the peak reading and the limit. Explanation of the correction and calculation are given in section 5.1.

Test Personnel:



Typed/Printed Name: Edward Lee

Date: January 25, 2011

**Radiated Test Data (CH-906MHz/914MHz/922MHz)**

Frequency (MHz)	Polarity (V,H) Position (X,Y,Z)	Antenna Height (m)	Azimuth (Degree)	Peak Reading at 3m (2) (dBuV/m)	Peak Reading After Correction (dBuV/m)	FCC 3m Limit (1) (dBuV/m)	Difference (dBuV/m)
906	V	1.2	195	104.7	92.2	94	-1.8
1812	V	1.1	000	58.6	46.1	54	-7.9
2718	V	1.1	180	56.7	44.2	54	-9.8
906	H	1.2	180	104.6	92.1	94	-1.9
1812	H	1.1	270	53.8	41.3	54	-12.7
2718	H	1.1	180	55.0	42.5	54	-11.5
914	V	1.2	000	99.4	86.9	94	-7.1
1828	V	1.1	090	58.3	45.8	54	-8.2
2712	V	1.0	090	63.9	51.4	54	-2.6
914	H	1.2	180	95.0	82.5	94	-11.5
1828	H	1.1	180	60.8	48.3	54	-5.7
2742	H	1.0	180	61.7	49.2	54	-4.8
922	V	1.2	195	103.4	90.9	94	-3.1
1844	V	1.0	000	56.9	44.4	54	-9.6
2766	V	1.0	180	64.0	51.5	54	-2.5
922	H	1.2	165	99.7	87.2	94	-6.8
1844	H	1.1	045	54.8	42.3	54	-11.7
2766	H	1.0	180	62.8	50.3	54	-3.7

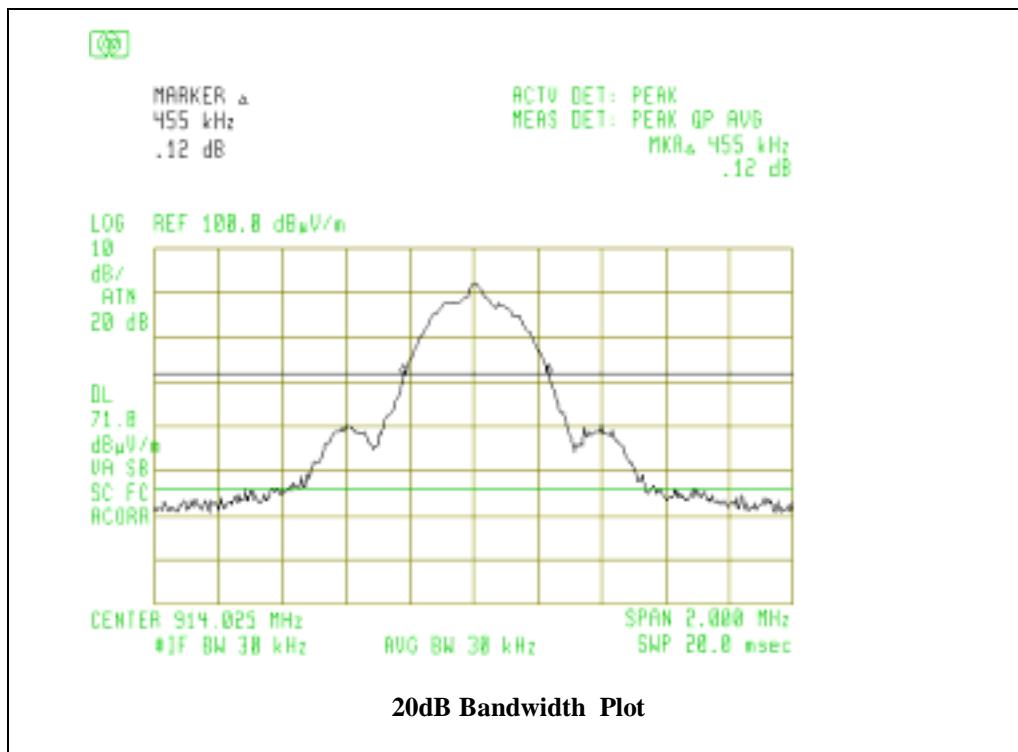
(1) The limit for emissions within the 902-928MHz band is 50mV(94dB) per Sec. 15.249. The limit for its harmonics is 500uV (54dB). Other spurious emissions shall be lower than either its fundamental by 50dB or the limit defined in Sec. 15.209, whichever is higher.

(2) If each peak reading is less than the FCC average limit, it'll be not necessary to show the measured/ calculated average reading.

**Other Spurious outside of the band 902-928MHz**  
 (the worst case of investigated L, M, H channel operation modes)

Frequency (MHz)	Polarity (V,H) Position X	Antenna Height (m)	Azimuth (Degree)	Peak Reading at 3m (2) (dBuV/m)	Peak Reading After Correction (dBuV/m)	FCC 3m Limit (1) (dBuV/m)	Difference (dBuV/m)
40.2	V	1.1	000	38.6		40.0	-1.4
172	V	1.1	190	38.0		43.5	-5.5
196	V	1.1	000	40.8		43.5	-2.7
200	V	1.2	270	39.8		43.5	-3.7
210	V	1.2	270	36.8		43.5	-6.7
240	V	1.0	000	34.2		46.5	-12.3
40.2	H	1.4	180	34.2		40.0	-5.8
64.9	H	1.4	090	30.3		40.0	-9.7
200	H	1.1	090	37.8		43.5	-5.7
210	H	1.1	090	35.1		43.5	-8.4
330	H	1.0	180	34.6		46.5	-11.9

Comparing to the limit defined in Sec. 15.209, emissions below the limit by 20dB were not recorded.



**Pulse Train and Duty Cycle Calculation over 100ms Worst Case Window**

FCC: OF7CL9, OF7WS9, OF7SP9  
IC: 3575A-CL9, 3575A-WS9, 3575A-SP9



T  $\Rightarrow$  A :: 11.9ms (11.9ms = 24bytes @ 396us/byte + 2.4ms preamble)

A  $\Rightarrow$  B :: 10 ms

B  $\Rightarrow$  C :: 11.9ms (optional repeat if ACK not received.)

C  $\Rightarrow$  D :: 68.2 ms

T  $\Rightarrow$  D :: 100ms

Duty Cycle :: 23.8% = (11.9 + 11.9) / 100

**Duty Cycle Plot**

## 6.4 EUT RECEIVING MODE VERIFICATION

### Radiated Test Data for Receiving Mode

(the worst case of investigated L, M, H channel operation modes)

Frequency (MHz)	Polarity (H or V)	Antenna Height (m)	Azimuth (Degree)	Peak Reading at 3m(2) (dBuV/m)	FCC 3m Limit(1) (dBuV/m)	Difference (dBuV/m)
200	V	1.2	090	23.8	43.5	-19.7
250	V	1.2	090	23.7	46.5	-22.8
330	V	1.1	180	24.3	46.5	-22.2
430	V	1.1	270	25.6	46.5	-20.9
200	H	1.1	000	23.8	43.5	-19.7
380	H	1.1	180	25.3	46.5	-21.2
400	H	1.0	180	26.3	46.5	-20.2
430	H	1.0	180	27.1	46.5	-19.4

- (1) Receiving mode spurious emissions shall be lower than the limit defined in Sec. 15.209.
- (2) If each peak reading is less than the FCC average limit, it'll be not necessary to show the measured/ calculated average reading.