RF Emissions Test Report
To Determine Compliance With:
FCC, Part 15
Rules and Regulations

Model number: T180DC
July 14, 2003

Manufacturer: Cooper Lighting
1121 Highway 74 South
Peachtree City, GA 30269

Contents Section

Section 1

General Information

Manufacturer:	Cooper Lighting 1121 Highway 74 South Peachtree City, GA 30269
Manufacturer representative:	**Mr. Wai-Shing Ko**
Equipment covered by this report:	Model no.: T180DC
Options covered by this report:	None
Equipment serial no.	Prototype
Test specifications:	To determine compliance with: FCC, Part 15.231, Subpart C Rules and Regulations, Class B
Test report number:	03-146A
Test commenced:	May 16, 2003
Test completed:	May 19, 2003
Test engineer:	**Edward Barnes**

Test Facility: The test facility used to perform these tests is on file with the FCC under registration number 637500 and located at:

EMC Testing Laboratories, Inc.
2210 Justin Trail
Alpharetta, GA 30004

Section 2

Test report summary sheet 1 of 2

Summary:

Tests	Results
FCC, Part 15, Class B, Radiated emissions:	**Pass**
FCC, Part 15, Class B, Conducted emissions:	**N/A**

1- The product(s) covered by this report was found to comply with the limits indicated in paragraphs 15.109 Subpart B and 15.231, Part 15, Subpart C of the FCC Rules and Regulations.

Note: The conducted emissions test was not performed since the EUT is battery operated with no means for connection to public mains.

Product description:
The product(s) covered by this report consisted of a battery operated transmitter, intended for use with lighting equipment .

The transmitter is an intentional radiator operating at 315MHz and transmits when a motion detector detects motion. The transmitter cannot transmit again until no motion is detected from 4 to 12 minutes. After the 4 to 12 minute timer has expired the transmitter is then ready to detect motion again. The transmit duration is 2 seconds maximum (on time). For the purpose of testing, the unit was set to a 50% duty cycle.

The equipment utilizes a maximum 2 second pulse that occurs at a maximum frequency of once every 4 minutes in normal operation.

The enclosure is constructed of plastic in the shape of a semicircle with a 3cm radius and 5cm height and encloses the following components judged as critical:

1. A main board, part no. SMH201-2 Rev. 2.

2. An encoder board, part no. SMH201-4 Rev. 0.

3. A house code board, part no. SMH2010-3 Rev. 0.

4. Four new, fully charged AA Energizer industrial alkaline batteries.

Test report summary sheet 2 of 2

Test configuration:
The equipment under test was set-up and configured as specified by the manufacturer.

1- The EUT was connected to the following support peripherals.

A) None

2- The EUT was connected to the following cables.

A) None

Test operation:
For all measurements, the equipment under test was and caused to function in a continuous mode of operation for maximum electrical activity as specified by the manufacturer. Specifically, the EUT was put in a 50% duty cycle when powered on.

Modifications:
The following modifications were required to comply with the indicated limits:

1- None

Conclusion:
With the above indicated modifications, the product(s) covered by this report has been tested and found to comply with the limits indicated in paragraph 15.231 table (b) of the FCC, Part 15, Subpart C Rules and Regulations and all subsequent limits indicated therein for a class B device.

Tested by:

Edward Barnes
RF Engineer
EMC Testing Laboratories, Inc.
July 14, 2003

Reviewed by:

Gene J. Bailey
Engineering Manager
EMC Testing Laboratories, Inc.
July 14, 2003

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(Reserved for future use)

Section 3

STANDARD REFERENCE

The following primary standards were used for this test:

1) **ANSI C63.4-1992:** Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9 Khz to 40 Ghz.

2) **US Code of Federal Regulations (CFR) 1998:** Title 47, Part 15, Radio Frequency Devices, Subpart C, Intentional Radiators.

Section 4

TEST METHOD

INTRODUCTION:

The product(s) covered by this report were subjected to electromagnetic interference emissions measurements to determine compliance with the FCC, Part 15 requirements.

Radiated emissions were measured in accordance with Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 Khz to 40 Ghz, C63.4.

MEASUREMENT CALCULATIONS:

Radiated Emissions:

For radiated emissions measurements, the signal attenuation due to impedance losses in the antenna and signal cable was significant and was added to the spectrum analyzer reading to give corrected signal strength reading. If a preamplifier was used, the signal gain was subtracted from the signal strength reading. Radiated emissions data was specified as microvolt per meter (dBμV/m) of radiated field strength.

Radiated emissions (dBμV/m) = Analyzer reading (dBμV) plus
antenna factor (dB) plus cable factor (dB) minus Amplifier gain (dB)

RADIATED EMISSIONS MEASUREMENT:

Radiated emissions measurements were performed at an open field test site. The receiving antenna was positioned 3 to 10 meters from the equipment under test as indicated below, along the center axis of the test site. Measurements were made with broadband antennas and if necessary, detected emissions were verified with dipole antennas. The dipole antenna was manually tuned to the signal frequency by adjusting the length of the antenna elements. The radiated emissions were measured for both the horizontal and vertical signal planes by rotating the antennas. Additionally, the EUT was rotated by the turntable and the antenna height was raised and lowered 1 to 4 meters to locate the maximum emission strength at each frequency.

Section 4 cont…

Emission measurements made from 30MHz to 1000MHz were made at an antenna to EUT distance of 10 meters.

Emission measurements made from 1000 MHz to 3.15 GHz were made at an antenna to EUT distance of 3 meters.

The following antennas were used to measure the radiated emissions within the specified frequency spans.

Antenna	Frequency Span
Biconical	20 - 200 Mhz
Log Periodic	200 - 1000 Mhz
Dipoles	20 - 1000 Mhz
Horn	1-18 Ghz

INSTRUMENTATION:

Radiated strength measurements were taken with a spectrum analyzer. Radiated emissions are measured with broadband and tuned dipole antennas. The test equipment consists of the following:

Test Equipment	Model No.	Serial No.	Cal. Due
Spectrum Analyzer	HP 8591A	3144A02506	01-06-04
Spectrum Analyzer	8592L	3649A00744	01-10-04
LISN	94641-1	0145/0146	06-05-04
LISN	3825/2	9305-2088	08-21-03
LISN	LI-210	25145	07-10-03
Biconical Antenna	3110B	1708	10-01-03
Biconical Antenna	BIA-25	2451	09-18-03
Log Periodic	LPA25	1112	10-01-03
Dipole Antenna	DM-105A-T1	31402-110	06-05-04
Dipole Antenna	DM-105A-T2	31402-105	06-05-04
Dipole Antenna	DM-105A-T3	31402-109	06-05-04
Horn Antenna	3115	9405-4264	10-01-03
R.F. Amplifier	QB-820	11602	01-11-04
Preamplifier	8449B	3008A00914	01-07-04

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DETECTOR FUNCTION FOR OUT OF BAND EMISSIONS:

The out of band emissions measurements were taken using a peak hold signal detector function. In this mode, the spectrum analyzer makes continuous scans across the frequency ban and stores the highest emission value detected at each frequency for all scans. The peak hold integration will detect transient or low duty cycle emissions peak which might be missed on single scan measurement. The emission value at each frequency was a true value.

SPECTRUM ANALYZER SETTING FOR OUT OF BAND EMISSIONS:

For all out of band emissions measurements, the spectrum analyzer was set for a 10 dB input attenuation, 10 dB/Division vertical scale and 90 or 100 dBμV reference level. The resolution bandwidth is set at 9 Khz for the 0.45 - 30 Mhz span and at 120 Khz for 30 - 1000 Mhz span. The video bandwidth and sweep rates were automatically coupled by the analyzer.

Section 5

RADIATED OUT OF BAND EMISSIONS MEASUREMENTS

Radiated Out of Band Emissions - Section 15.209 Limits

Model number: T180DC **Test date:** 5/19/03

Frequency Mhz	Measurement Reading dBµV	Corrected Reading dBµV	FCC Limit dBµV	Minimum Margin dBµV
There were no measurable emissions within 20 dBµV of the limits with the antenna in the vertical or horizontal polarizations.				

Section 6

Fundamental Frequency Radiated Emissions Measurements

EMISSION MEASUREMENTS FOR EQUIPMENT WITH PERIODIC OPERATION IN THE BAND 40.66 – 40.70 MHz AND ABOVE 70 MHz:

As per Section 15.231 of the 47 CFR and in accordance with the measurement provisions in Section 15.35, the peak and average emissions field strength of the fundamental frequency were measured and recorded. For the harmonics emissions above 1000 MHz, peak and average measurements were recorded. After measurement data was recorded the data was then corrected, as indicated in the Measurement Calculations section above.

With the spectrum analyzer in the Linear mode and the resolution bandwidth set to 10Khz, the duty cycle was measured as indicated in section 15.35, (see duty cycle calculation below). The average measurement was then calculated using the below Average measurement calculation.

Pulse width / 100mS = Duty Cycle

Peak Value (uV/m) x Duty Cycle = Average measurement (uV/m)

During the emission measurements of the fundamental frequency and harmonics up to 1000 MHz, the antenna was positioned 10 meters from the EUT and with the spectrum analyzer in the Linear mode and the resolution bandwidth set to 100Khz minimum resolution bandwidth the fundamental frequency was measured. The measurements were performed with the antenna in the horizontal and vertical polarization. The fundamental frequency's peak measurements were taken as indicated in the plot.

During the emission measurements above 1000MHz of the harmonic emissions of the fundamental frequency, the antenna was positioned 3 meters from the EUT and with the spectrum analyzer in the Linear mode and the resolution bandwidth set to 1 MHz minimum, the harmonic emissions were measured. The measurements were performed with the antenna in the horizontal and vertical polarization.

Additionally the following table shows that the maximum field strength for the fundamental frequency was in compliance with the peak limits as indicated in Section 15.231.

The limits indicated in the tables below have been calculated for the measurement distances as indicated above.

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Model: T180DC **Date:** May 16, 2003

Frequency Mhz	Detection Method	Total Level dBµV/m	FCC Limit (Avg.) dBµV/m	Margin dBµV
Horizontal				
314.9	Peak	71.5	85.6 (Peak Limit)	-14.1
314.9	Average	65.5	65.6	**-0.1**
629.9	Peak	36.0	45.6	-17.5
944.8	Peak	46.8	65.6 (Peak Limit)	-18.8
944.8	Average	40.8	45.6	-4.8
1259.8	Peak	47.2	54.0	-6.8
1574.2	Peak	44.2	54.0	-9.8
Vertical				
314.9	Peak	63.9	65.6	**-1.7**
629.8	Peak	38.6	45.6	-7.0
944.8	Peak	40.5	45.6	-5.1
1259.7	Peak	41.4	54.0	-12.6
2519.5	Peak	42.0	54.0	-12.0

Section 7

Occupied Bandwidth Measurements

OCCUPIED BANDWIDTH MEASUREMENTS:

As per Section 15.231 (c), the minimum 20dB bandwidth is less than 0.25% of the center frequency. The bandwidth was measured with the spectrum analyzer's resolution bandwidth set to 100 kHz and the span set to 1 MHz. The measurement was taken 20dB down on each side of the center frequency and the total occupied bandwidth was recorded.

Center Frequency Mhz	Allowed Occupied Bandwidth	Total Occupied Bandwidth
314.9	787 kHz	420 kHz

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