

LAIRD TECHNOLOGIES – WORLD COMPLIANCE CENTER

FCC PART 15 CERTIFICATION Manufacturer: JBS Technologies, LLC EUT: 0045 Magnum remote FCC ID: J3S0045CH00	<i>Document No.</i>	<i>Revision</i>	<i>Issue Date</i>
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EMC TEST REPORT

Manufacturer: JBS Technologies, LLC
Equipment Under Test: 0045 Magnum remote
FCC ID: J3S0045CH00

Test Report No.: 196984
Purchase Order No.: 24239

DOCUMENT HISTORY

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TEST REPORT NO. 196984
From
Laird Technologies
World Compliance Center

Test for
JBS Technologies
EUT: 0045 Magnum Remote
FCC ID: J3S0045CH00

Written By	Bridget A. Keesser, EMC Sales Representative	Date
Reviewed By	Grant Metzgar, Sr. EMC Technician	Date
Authorized By	J. Fred Gardner, EMC Quality Assurance	Date

TEST PERSONNEL – Laird Technologies

Grant Metzgar, Sr. EMC Technician	4 June and 25 July 2003
Barkley F. Wesselius, EMC Technician	25 July 2003

EUT RECEIPT/DISPOSITION INFORMATION

Date of Receipt of Equipment Under Test (EUT)	4 June 2003
Disposition of EUT	Retained by Manufacturer

Test Facility	Laird Technologies
Address	Shielding Way
City, State Zip Code	Delaware Water Gap, PA 18327
Phone	(570) 424-8510 ext. 1216
Fax	(570) 421-4227

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1 INTRODUCTION

This report documents the results of a series of EMI/EMC measurements performed on the EUT described in Section 3 of this report. The purpose of this series of tests was to demonstrate compliance to the requirements of FCC Part 15 for intentional transmitters. This report contains a report of the measurements only. The manufacture must also comply with other requirements of the FCC rules such as labeling requirements in order to market the device. Addition information such as the operators manual, block diagrams, schematics and internal photos, which are not included in this report, must be provided to the FCC or appropriate authorities upon request.

Testing was performed by the Laird Technologies at the Delaware Water Gap, Pennsylvania World Compliance Center. Tests were performed using the test set-ups of the relevant standards for tests performed in laboratory conditions.

1.1 Description Of World Compliance Center

Laird Technologies World Compliance Center is an independent EMC test laboratory offering interference control testing for FCC, MIL-STD-461, EMC Directive, Medical Devices Directive, Product Safety, and other requirements, as well as, consulting, design engineering, and compliance seminars.

The World Compliance Center is accredited by NVLAP (LAB CODE: 200076-0) for FCC Part 15, IEC/CISPR 22 AS/NZS 3548 and CNS 13438 for emissions measurements and the IEC 61000 series for immunity tests. The test lab is also assessed by the Civil Aviation Authority for measurements to the EMC Directive for aeronautical equipment. The open area test site and measurement facility used to collect the radiated data is filed with the FCC and accepted in a letter dated 11 August 2000 (Registration Number 90682) and Industry Canada (File Number IC 3147). The test site is registered with VCCI for conducted emissions (Registration No. C-1265) and radiated emissions (Registration No. R-1203). Laird Technology is accepted by the European Commission as a U.S. Conformity Assessment Body (CAB) in accordance with the Mutual Recognition Agreement (MRA) as monitored by NIST. Laird Technologies is registered by SGS Yarsley International Certification Services, LTD. to ISO 9001

1.2 Summary of Work Done

Equipment Model Name	0045 Magnum Remote
U. S. Federal Regulations	47 CFR Chapter 1

1.2.1 Summary of EMC Emission Tests

Specification Name	Test Name	Limit	Judgement
FCC Part 15	Radiated Emissions	Paragraph 15.231 of FCC Part 15	passed by 1.90 dB

1.2.2 Summary Conclusion / Declaration

The EUT as described and reported within this document, meets FCC requirements for intentional transmitters as tested in accordance with ANSI C63.4-1992 without any modifications. The results reported are valid for this EUT only and are representative of a production unit only in as much as the unit tested represents a production unit.

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2 CLIENT INFORMATION

Company Name	JBS Technologies
Address	225 Technology Way
City, State Zip Code	Steubenville, OH 43952
Contact Name	Scott Hanood
Title	Operations Manager
Phone	740-282-1212 ext. 134
Fax	740-282-1201
Email Address	SHANOOD@BULLDOGSECURITY.COM

3 EQUIPMENT UNDER TEST (EUT)

3.1 Identification of EUT

The EUT is a 0045 Magnum remote.

3.2 Description of System

The Model 0045 Magnum remote is a transmitter used in the auto industry.

3.3 Table: Components of the EUT

The EUT was tested as a stand-alone system.

3.4 Table: Cabling of the EUT

There is no associated cabling with the EUT.

3.5 Accessory/Peripheral Equipment

The EUT was tested as a stand-alone system.

3.6 Modifications Incorporated in the EUT

No modifications were made to the EUT as a result of the EMC testing.

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4 PRODUCT LABELING

Labels are to follow the existing size requirements in that they must contain letters, numbers and symbols that are visible and readable without the use of magnification.

When the device is so small or for such use that is not practicable to place the statement specified on the label, such as for a CPU board or a plug-in circuit board peripheral device, the text associated with the logo may be placed in a prominent location in the instructional manual or pamphlet supplied to the user. However, the unique identification (trade name and model number) and the logo must be displayed on the device.

All warning statements regarding interference potential are to be placed in the user manual, rather than on the label as is currently required. The user manual contains general operating instruction on the use of a device, and, according to the FCC, placing the warning statements in the user manual would better serve the consumer. The requirement that an informational statement be included in the user's manual regarding actions the user can take to resolve any interference that may occur from use of the device is still required.

The label showing the equipment identification data may be combined with a label showing other information (serial numbers, other government requirements, etc.), if desired. Compliance statements, when required, may be shown on the same label or a separate label.

Country of Origin – US Customs and the Federal Trade Commission regulations require all equipment produced in foreign countries to be marked with the country of origin. Questions concerning marking of equipment with the country of origin should be directed to these agencies.

4.1 Location of Label on EUT

The label indicating the FCC ID will be located on the device.

The following label requirements of Section 2.925/2.926 and 15.19 will be placed in the operation manual:

This device complies with Part 15 of the FCC rules and regulations.
Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) This device must accept any interference received, including interference that may cause undesired operation.

4.2 Information to the User

In accordance with FCC rules Part 15.2, the users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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5 TEST SPECIFICATION, METHODS & PROCEDURES

5.1 Intentional Radiators

5.2 Emission Test Specification

Federal Regulations	Title 47 of the CFR, Part 15, subpart C 15.231 Periodic Operation in the band 40.66-40.70 and above 70 MHz 15.205 Restricted bands of Operation 15.209 radiated emissions, general requirements
ICES-003 Issue 3, November 22, 1997	Industry Canada's Electromagnetic Compatibility-Conducted and Radiated Emissions for a Class A Digital Apparatus
ANSI C63.4 – 2000	Methods of Measurements of Radio-Noise Emissions from Low-Voltage electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

6 DEVIATIONS, EXCLUSIONS FROM THE TEST SPECIFICATION

6.1 Deviations

The measurements were performed in accordance with the requirements of the test specification and the basic standards.

6.2 Exclusions

There were no exclusions from the test specification.

7 OPERATION OF EUT DURING TESTING

7.1 Operational Environment

The EUT is powered from an internal 12 VDC battery and was tested as a portable device in accordance with ANSI C63.4. The EUT transmit frequency was 305.79 MHz.

7.2 Operating Mode(s)

The EUT was tested for radiated emissions and spurious harmonics with the EUT modified to provide a continuous transmit mode with button two (2) on the transmitter held in an a pushed condition.

7.3 Related Submittal Grants

There are no related submittal grants.

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8 DETAILED TEST RESULTS

8.1 Antenna Requirements

There is no external antenna or customer replaceable antenna and therefore meets the requirements of FCC Part 15, paragraph 15.203.

8.2 Periodic operation

The transmitter deactivated within not more than 5 seconds of being released in accordance with FCC Part 15 paragraph 15.23.1.

8.3 Radiated Emissions

Testing was performed according to the procedures in ANSI C63.4-2000. Radiated testing was performed at an EUT to antenna distance of 3 meters. The following data lists the significant emission frequencies, measured levels, correction factor (includes cable, preamplifier and antenna corrections), the corrected reading, plus the limit. Spectrum analyzer plots and additional tabulated data are included in the Appendices of this document.

8.3.1 FCC Part 15 Radiated Emissions Test Results

8.3.1.1 FCC Part 15, Paragraph 15.209 Radiated Emissions Limits, general requirements.

Frequency Range MHz	3 meter Limit dB(mV/m)
30 – 88	40.0
88 – 216	43.52
216 – 960	46.00
960 and above	53.97

8.3.1.2 FCC Part 15, Paragraph 15.231 Periodic operation in the band 40.66-40.70 MHz and above 70 MHz

Fundamental Frequency	Field strength of fundamental	Field strength of spurious emissions
305.79 MHz	75.05 dBμV/M	55.05 dBμV/m

Limits were linearly extrapolated From FCC 15.231 (b) from 260 MHz to 470 MHz with a limit of 71.48 dBμV to 81.93 dBμV for the fundamental and 51.48 to 61.94 dBμV for the spurious emissions.

8.3.1.3 Table: Judgement

EUT	J3S0045CH00
Judgement	Passed by 1.9 dB

8.3.1.4 Table: Summary of Highest Radiated Emissions Levels

Frequency MHz	Polarity V/H	Antenna Height cm	Antenna Azimuth deg	Correction Factor dB(1/m)	Limit dB(mV/m)	Corrected Reading dB(mV/m)	Margin dB
305.79	H	100	0	-22.45	75.05	73.15	-1.90
611.13	H	100	0	-6.0	46.00*	43.30 QP	-2.70
916.23	H	100	0	-8.05	55.05	34.65	-20.40
1223.14	H	100	0	-3.27	46.00*	34.25	-11.75
1528.93	H	100	0	-2.00	46.00*	27.85	-18.15
1834.71	H	100	0	-6.33	55.05	3.67	-51.38

* Designates frequency in the restricted band of FCC Part 15.205 with limits of FCC Part 15.209.

Except as otherwise noted the field strength measurements were made using the average measurement method in accordance with FCC Part 15.35 (c) determined by averaging one complete pulse train, including blanking intervals over 0.1 seconds. Quasi peak measurements (QP) were made with an IF bandwidth of 120 kHz, along with a 100 ms sweep time. Measurements above 1 GHz were made with a 1MHz IF bandwidth. A video filter was not used. Duty cycle for average measurement deduction was determined to be 7.65 dB. The pulse train was 58.2 mSec total consisting of 21x 720 μSec pulses and 14 x 1.88 mSec pulses over a 100 mSec period for a total of 41.44% on

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time.

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8.2.2 Measurement Uncertainty

The measurement uncertainty (with a confidence level of 95%) for this test was: +/- 5.59 dB

8.2.3 Measured Calculation

Voltage measurements from FCC requirements were converted to logarithmic values using:
 $\text{dB}\mu\text{V} = 20_{10} \log (V/1 \times 10^{-6})$

The field strength is calculated by adding the antenna factor and cable factor, and subtracting the amplifier gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$\text{FS} = \text{RA} + \text{AF} + \text{CF} - \text{AG} - \text{DC}$$

where:

FS = field strength - dB($\mu\text{V}/\text{m}$)
 RA = receiver amplitude - dB(μV)
 AF = antenna factor - dB/m
 CF = cable attenuation factor - dB
 AG = amplifier gain – dB
 DC = duty cycle

Example: Assume a receiver reading of 95.6 dB(μV) is obtained. The antenna factor of 14.32 and cable factor of 3.38 is added. The amplifier gain of 32.5 dB is subtracted and the duty cycle correction factor is subtracted giving a field strength of 73.15 dB($\mu\text{V}/\text{m}$.)

8.4 Occupied Bandwidth

8.4.1 FCC Part 15, Paragraph 15.231 (C)

The bandwidth of the emission shall be no wider than 0.25% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

8.4.2 Judgement

The EUT complies with the occupational bandwidth requirements. See the supplemental data for plots of the bandwidth measurements.

9 TEST EQUIPMENT

The absolute performance calibration of equipment requiring calibration is performed on an as needed basis in accordance with MIL-STD 45662. However, calibration periods do not exceed one (1) year except for the E-Field sensors which have a two (2) year calibration interval. The test equipment is capable of making measurements within tolerances of at least +/- 2 dB amplitude and +/- 2% frequency deviation. Equipment certifications showing traceability to NIST (National Institute of Standards and Technology) are maintained on file at Laird Technologies Corporate offices in Delaware Water Gap, PA. All equipment is checked and verified for proper operation before and during each series of tests.

9.1 Radiated Emissions

Mfgr./Model	Description	Serial	Calibration Due
CHA/CBL6111A	(30 MHz - 1 GHz) bilog	1822	4/25/04
EMCO 3115	(1 – 18 GHz) double ridge guide antenna	2845	11/25/03
HP/8572A	(100 Hz - 22 GHz) EMI receiver sys #1	3010A01163	7/31/03
HP/85879A	EMI Radiated Emissions Measurement software	VA 02.01	Calibration Not Required
HP/8449B	Preamplifier	3008A01543	7/31/04

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10 DESCRIPTION OF TEST METHODS

10.1 Radiated Emissions Test Procedure

Test Specification: FCC Part 15

Test Location: The elevated open area test site (OATS) used to collect the radiated data is located at the Laird Technologies test facility in Delaware Water Gap, Pennsylvania. This site has been fully described in a report submitted to the Federal Communication Commission (31040/SIT 1300F2). The OATS meets the ANSI C63.4: 2000, normalized site attenuation requirements at three (3) and ten (10) meters.

Test Setup: The EUT was setup on the OATS in a typical installation configuration. The EUT was configured for pulse operation in a continuous mode. The EUT was set up in the following manner:

Table-top Equipment: The EUT was placed 80 centimeters above the ground plane on a non-conductive tabletop 1.0 meter wide x 1.5 meters long. The EUT was configured for hand held operation in accordance with ANSI C63.4. The amplitude level of the emissions were maximized by varying the configuration of the EUT and the antenna height.

Test Procedure: Measurements were performed in accordance with ANSI C63.4. The radiated emissions were measured using a receiver system that meets the fundamental characteristics of CISPR Publication 16. The measurements were performed with a quasi-peak adapter bandwidth of 120 kHz, unless otherwise noted on the data sheet. Average measurements were made by applying the duty cycle correction factor to the peak measurement of the modulated transmission. The measurement antennas are calibrated in accordance with ANSI C63.5: 1988.

A suspect frequency list was compiled with the following information:

- A) Preliminary radiated scan - performed in a shielded enclosure
- B) List of crystal oscillators installed in EUT and auxiliary equipment

The highest emissions were maximized by rotating the turntable 360 degrees and varying the antenna height 1 to 4 meters. The frequency range of 30 MHz to 1000 MHz was measured using a Bilog antenna. Measurements above 1 GHz were made using a double ridge wave guide antenna. Measurements were made in vertical and horizontal antenna polarizations. Amplitude levels were recorded in dB μ V/m.

10.2 Occupied Bandwidth

Occupied bandwidth measurements were made with the EUT operated in a continuous mode while modulating the signal. The receiver bandwidth was set for 100 kHz and peak measurements were made at 20 dB down from the peak measurement.

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11 PHOTOGRAPHS OF TEST ARRANGEMENTS

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Top	Radiated Emissions – test setup	FCC Part 15	12
Top	Radiated Emissions – test setup	FCC Part 15	13
Top	Radiated Emissions – test setup above 1 GHz	FCC Part 15	14
Top	Radiated Emissions – test setup above 1 GHz	FCC Part 15	15
Top	Radiated Emissions– test setup above 1 GHz	FCC Part 15	16

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12 SUPPLEMENTAL DATA

Test Type	Specification	Comments	Data Format	Page No.
Radiated Emission	FCC Part 15.209	General requirements excluding the transmitter portion	tabulated	18
Radiated Emissions	FCC Part 15.231	Radiated measurements fundamental pulse spurious harmonics	tabulated	19
Bandwidth	FCC Part 15.231	Occupied band width measurements	plotted	20
Duty Cycle	FCC Part 15.35	Duty cycle averaged over 0.1 seconds	plotted	21-24