

**FCC PART 15 SUBPART B and C  
TEST REPORT**
*for*
**TRIGGER TRANSMITTER**
**Model: 51817**

Prepared for

 CRAFCO, INC.  
 25527 SOUTH ARIZONA AVENUE  
 CHANDLER, ARIZONA 85249

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KYLE FUJIMOTO

 Approved by: James Ross

JAMES ROSS

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 114 OLINDA DRIVE  
 BREA, CALIFORNIA 92823  
 (714) 579-0500

DATE: NOVEMBER 16, 2009

|       | REPORT<br>BODY | APPENDICES |   |    |    |    | TOTAL |
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## GENERAL REPORT SUMMARY

Compatible Electronics Inc. generates this electromagnetic emission test report, which is an independent testing and consulting firm. The test report is based on testing performed by Compatible Electronics personnel according to the measurement procedures described in the test specifications given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced without the written permission of Compatible Electronics, unless done so in full.

This report must not be used to claim product endorsement by NVLAP, NIST or any other agency of the U.S. Government.

Device Tested: Trigger Transmitter  
 Model: 51817  
 S/N: N/A

Product Description: See Expository Statement

Modifications: The EUT was not modified in order to meet the specifications.

Customer: Crafco, Inc.  
 25527 South Arizona Avenue  
 Chandler, Arizona 85249

Test Date(s): November 6, 2009

Test Specifications: EMI requirements  
 CFR Title 47, Part 15, Subpart B

Test Procedure: ANSI C63.4

Test Deviations: The test procedure was not deviated from during the testing.

## SUMMARY OF TEST RESULTS

| TEST | DESCRIPTION   | RESULTS   |
|------|---|---|
| 1    | Conducted RF Emissions, 150 kHz – 30 MHz                            | The EUT does not directly or indirectly connect to the AC mains, thus this test was not performed.  |
| 2    | Radiated RF Emissions<br>10 kHz – 3200 MHz<br>(Transmitter Portion) | Complies with the limits of CFR Title 47, Part 15, Subpart C, sections 15.205, 15.209, and 15.231.<br>Highest reading in relation to spec limit: 72.8681 dBuV @ 315 MHz (* $U_c$ = 1.76 dB) |
| 3    | Radiated RF Emissions<br>10 kHz – 3200 MHz<br>(Digital Portion)     | Complies with the <b>Class B</b> limits of CFR Title 47, Part 15, Subpart B.  |

\* $U_c$  = combined standard uncertainty

## 1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the Trigger Transmitter, Model: 51817. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT hereafter, are within the Class B specification limits defined by CFR Title 47, Part 15, Subpart B for the digital portion; and the limits defined in Subpart C, sections 15.205, 15.209, and 15.231 for the transmitter portion.



## 2. ADMINISTRATIVE DATA

## 2.1 Location of Testing

The EMI tests described herein were performed at the test facility of Compatible Electronics, 114 Olinda Drive, Brea, California.

## 2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The calibration is traceable to the National Institute of Standards and Technology (NIST).

## 2.3 Cognizant Personnel

## Crafco, Inc.

Don Timme Senior Design Engineer

Compatible Electronics Inc.

Kyle Fujimoto      Test Engineer  
James Ross      Test Engineer

## 2.4 Date Test Sample was Received

The test sample was received prior to the date of testing.

## 2.5 Disposition of the Test Sample

The test sample has not yet been returned as of the date of this report.

## 2.6 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document.

|       |   |
|-------|---|
| FCC   | Federal Communications Commission                   |
| RF    | Radio Frequency                                     |
| EMI   | Electromagnetic Interference                        |
| EUT   | Equipment Under Test                                |
| P/N   | Part Number   |
| S/N   | Serial Number                                       |
| ITE   | Information Technology Equipment                    |
| LISN  | Line Impedance Stabilization Network                |
| NVLAP | National Voluntary Laboratory Accreditation Program |
| CFR   | Code of Federal Regulations                         |
| N/A   | Not Applicable                                      |
| Ltd.  | Limited   |
| Inc.  | Incorporated  |
| IR    | Infrared  |

### 3. APPLICABLE DOCUMENTS

The following documents are referenced or used in the preparation of this EMI Test Report.

| SPEC                     | TITLE   |
|--------------------------|---|
| CFR Title 47,<br>Part 15 | FCC Rules – Radio frequency devices (including digital devices)   |
| ANSI C63.4:<br>2003      | American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz |

## 4. DESCRIPTION OF TEST CONFIGURATION

### 4.1 Description of Test Configuration – EMI

The Trigger Transmitter, Model: 51817 (EUT) was tested as a stand alone unit in three orthogonal axis. The EUT was continuously transmitting.

The EUT's antenna is a PCB trace. The EUT stops transmitting immediately after the button is released during normal usage.

It was determined that the emissions were at their highest level when the EUT was operating in the above configuration. The final emissions data was taken in this mode of operation and any cables were maximized. All initial investigations were performed with the measurement receiver in manual mode scanning the frequency range continuously. Photographs of the test setup are in Appendix D of this report.

#### 4.1.1 **Cable Construction and Termination**

There are no external cables connected to the EUT.



**5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT****5.1 EUT and Accessory List**

| EQUIPMENT                    | MANUFACTURER | MODEL NUMBER | SERIAL NUMBER | FCC ID   |
|------------------------------|--------------|--------------|---------------|----------|
| TRIGGER TRANSMITTER<br>(EUT) | CRAFCO, INC. | 51817        | N/A           | V9T51817 |



5.2 **EMI Test Equipment**

| EQUIPMENT TYPE  | MANUFACTURER    | MODEL NUMBER | SERIAL NUMBER | CALIBRATION DATE   | CALIBRATION DUE DATE |
|---|-----------------|--------------|---------------|--------------------|----------------------|
| <b>GENERAL TEST EQUIPMENT USED FOR ALL RF EMISSIONS TESTS</b> |                 |              |               |                    |                      |
| Computer  | Hewlett Packard | 4530         | US91912319    | N/A                | N/A                  |
| Spectrum Analyzer – Main Section                              | Hewlett Packard | 8566B        | 3638A08784    | May 29, 2009       | May 29, 2010         |
| Spectrum Analyzer – Display Section                           | Hewlett Packard | 85662A       | 2648A14530    | May 29, 2009       | May 29, 2010         |
| Quasi-Peak Adapter  | Hewlett Packard | 85650A       | 2430A00424    | May 29, 2009       | May 29, 2010         |
| EMI Receiver  | Rohde & Schwarz | ESIB40       | 100194        | September 17, 2008 | Sept. 17, 2010       |
| Monitor   | Hewlett Packard | D5258A       | TW74500641    | N/A                | N/A                  |
| <b>RF RADIATED EMISSIONS TEST EQUIPMENT</b>                   |                 |              |               |                    |                      |
| Biconical Antenna   | Com Power       | AB-900       | 15250         | February 23, 2009  | Feb. 23, 2010        |
| Log Periodic Antenna  | Com Power       | AL-100       | 16060         | June 15, 2009      | June 15, 2010        |
| Preamplifier  | Com-Power       | PA-102       | 1017          | January 12, 2009   | Jan. 12, 2010        |
| Loop Antenna  | Com-Power       | AL-130       | 17089         | September 29, 2008 | Sept. 29, 2010       |
| Horn Antenna  | Com-Power       | AH-118       | 071175        | June 27, 2008      | June 27, 2010        |
| Microwave Preamplifier  | Com Power       | PA-122       | 181921        | March 12, 2009     | March 12, 2010       |
| Antenna Mast  | Com Power       | AM-100       | N/A           | N/A                | N/A                  |

## 6. TEST SITE DESCRIPTION

### 6.1 Test Facility Description

Please refer to section 2.1 and 7.1.2 of this report for EMI test location.

### 6.2 EUT Mounting, Bonding and Grounding

The EUT was mounted on a 1.0 by 1.5 meter non-conductive table 0.8 meters above the ground plane.

The EUT was not grounded.

### 6.3 Facility Environmental Characteristics

When applicable refer to the data sheets in Appendix E for the relative humidity, air temperature, and barometric pressure.

## 7. TEST PROCEDURES

The following sections describe the test methods and the specifications for the tests. Test results are also included in this section.

### 7.1 RF Emissions

#### 7.1.1 Conducted Emissions Test

The measurement receiver was used as a measuring meter. The data was collected with the measurement receiver in the peak detect mode with the "Max Hold" feature activated. The quasi-peak was used only where indicated in the data sheets. A transient limiter was used for the protection of the measurement receiver's input stage, and the offset was adjusted accordingly to read the actual data measured. The LISN output was measured using the measurement receiver. The output of the second LISN was terminated by a 50-ohm termination. The effective measurement bandwidth used for this test was 9 kHz.

Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The EUT was powered through the LISN, which was bonded to the ground plane. The LISN power was filtered and the filter was bonded to the ground plane. The EUT was set up with the minimum distances from any conductive surfaces as specified in ANSI C63.4. The excess power cord was wrapped in a figure eight pattern to form a bundle not exceeding 0.4 meters in length.

The conducted emissions from the EUT were maximized for operating mode as well as cable placement. The final data was collected under program control by the Compatible Electronics conducted emissions software in several overlapping sweeps by running the spectrum analyzer at a minimum scan rate of 10 seconds per octave. The final qualification data is located in Appendix E.

#### Test Results:

The EUT does not directly or indirectly connect to the AC mains, thus this test was not performed.

### 7.1.2

### Radiated Emissions (Spurious and Harmonics) Test

The measurement receiver was used as a measuring meter. A preamplifier was used to increase the sensitivity of the instrument. The measurement receiver was used in the peak detect mode with the “Max Hold” feature activated. In this mode, the measurement receiver records the highest measured reading over all the sweeps.

The readings were averaged by a “duty cycle correction factor”, derived from  $20 \log$  (dwell time / one pulse train with blanking interval). The measurement bandwidths and transducers used for the radiated emissions test were:

| FREQUENCY RANGE      | TRANSDUCER           | EFFECTIVE MEASUREMENT BANDWIDTH |
|----------------------|----------------------|---------------------------------|
| 9 kHz to 150 kHz     | Active Loop Antenna  | 200 Hz                          |
| 150 kHz to 30 MHz    | Active Loop Antenna  | 9 kHz                           |
| 30 MHz to 300 MHz    | Biconical Antenna    | 120 kHz                         |
| 300 MHz to 1000 MHz  | Log Periodic Antenna | 120 kHz                         |
| 1000 MHz to 3200 MHz | Horn Antenna         | 1 MHz                           |

The final data was taken with a frequency span of 1 MHz for frequencies below 1000 MHz. For frequencies above 1000 MHz, the final data was taken with a frequency span of 10 MHz. The frequency span was reduced during the preliminary investigations as deemed necessary to distinguish between emissions from the EUT and any ambient signals.

The open field test site of Compatible Electronics, Inc. was used for radiated emission testing. This test site is set up according to ANSI C63.4. Please see section 6.2 of this report for mounting, bonding, and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters (for E field radiated field strength). The gunsight method was used when measuring with the horn antenna to ensure accurate results. The loop antenna was also rotated in the horizontal and vertical axis in order to ensure accurate results.

### Radiated Emissions (Spurious and Harmonics) Test (Continued)

The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the ambient signal does not hide any emissions from the EUT. The EUT was tested at a 3-meter distance to obtain final test data. The final qualification data is located in Appendix E.

#### Test Results:

The EUT complies with the **Class B** limits of CFR Title 47, Part 15, Subpart B; and CFR Title 47, Part 15, Subpart C, sections 15.205, 15.209, and 15.231.

**7.2****Bandwidth of the Fundamental**

The -20 dB bandwidth was checked to see that it was within 0.25% of the fundamental frequency for the EUT. Plots of the -20 dB bandwidth are located in Appendix E.

**Test Results:**

The EUT complies with the limits of CFR Title 47, Part 15, Subpart C, section 15.231(c).



## 8. CONCLUSIONS

The Trigger Transmitter, Model: 51817, as tested, meets all of the **Class B** specification limits defined in CFR Title 47, Part 15, Subpart B for the digital portion; and the limits defined in Subpart C, sections 15.205, 15.209, and 15.231 for the transmitter portion.



## APPENDIX A

### ***LABORATORY RECOGNITIONS***

---

**Brea Division**  
**114 Olinda Drive**  
**Brea, CA 92823**  
**(714) 579-0500**

**Agoura Division**  
**2337 Troutdale Drive**  
**Agoura, CA 91301**  
**(818) 597-0600**

**Silverado Division**  
**19121 El Toro Road**  
**Silverado, CA 92676**  
**(949) 589-0700**

**Lake Forest Division**  
**20621 Pascal Way**  
**Lake Forest, CA 92630**  
**(949) 587-0400**

## **LABORATORY RECOGNITIONS**

**Compatible Electronics has the following agency accreditations:**

National Voluntary Laboratory Accreditation Program - Lab Code: 200528-0

Voluntary Control Council for Interference - Registration Numbers: R-983, C-1026, R-984 and C-1027

Bureau of Standards and Metrology Inspection - Reference Number: SL2-IN-E-1031

Conformity Assessment Body for the EMC Directive Under the US/EU MRA Appointed by NIST

**Compatible Electronics is recognized or on file with the following agencies:**

Federal Communications Commission

Industry Canada

## APPENDIX B

### ***MODIFICATIONS TO THE EUT***

---

**Brea Division**  
**114 Olinda Drive**  
**Brea, CA 92823**  
**(714) 579-0500**

**Agoura Division**  
**2337 Troutdale Drive**  
**Agoura, CA 91301**  
**(818) 597-0600**

**Silverado Division**  
**19121 El Toro Road**  
**Silverado, CA 92676**  
**(949) 589-0700**

**Lake Forest Division**  
**20621 Pascal Way**  
**Lake Forest, CA 92630**  
**(949) 587-0400**

## MODIFICATIONS TO THE EUT

The modifications listed below were made to the EUT to pass FCC 15.231 and/or FCC **Class B** specifications.

All the rework described below was implemented during the test in a method that could be reproduced in all the units by the manufacturer.

No modifications were made to the EUT during the testing.



## APPENDIX C

### ***ADDITIONAL MODELS COVERED UNDER THIS REPORT***

---

**Brea Division**  
**114 Olinda Drive**  
**Brea, CA 92823**  
**(714) 579-0500**

**Agoura Division**  
**2337 Troutdale Drive**  
**Agoura, CA 91301**  
**(818) 597-0600**

**Silverado Division**  
**19121 El Toro Road**  
**Silverado, CA 92676**  
**(949) 589-0700**

**Lake Forest Division**  
**20621 Pascal Way**  
**Lake Forest, CA 92630**  
**(949) 587-0400**

## **ADDITIONAL MODELS COVERED UNDER THIS REPORT**

### **USED FOR THE PRIMARY TEST**

Trigger Transmitter  
Model: 51817  
S/N: N/A

No additional models were covered under this report.



## **APPENDIX D**

### ***DIAGRAMS, CHARTS, AND PHOTOS***

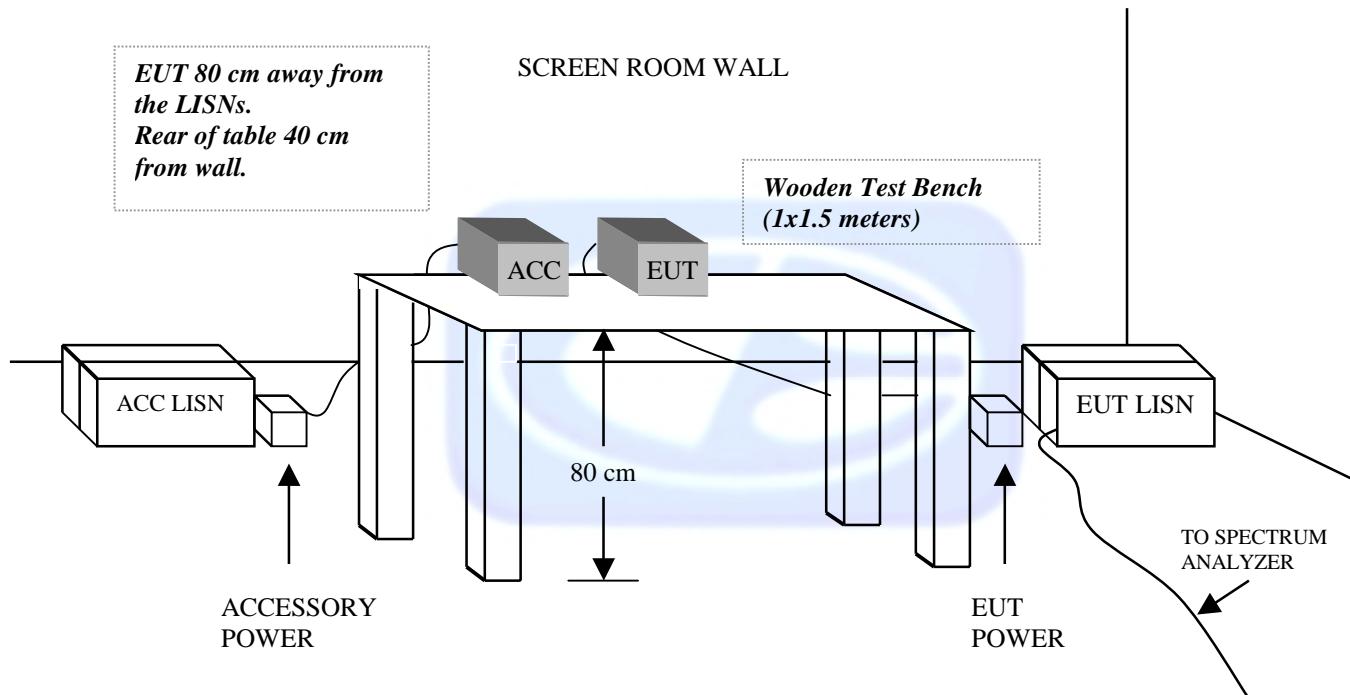
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**Brea Division**  
**114 Olinda Drive**  
**Brea, CA 92823**  
**(714) 579-0500**

**Agoura Division**  
**2337 Troutdale Drive**  
**Agoura, CA 91301**  
**(818) 597-0600**

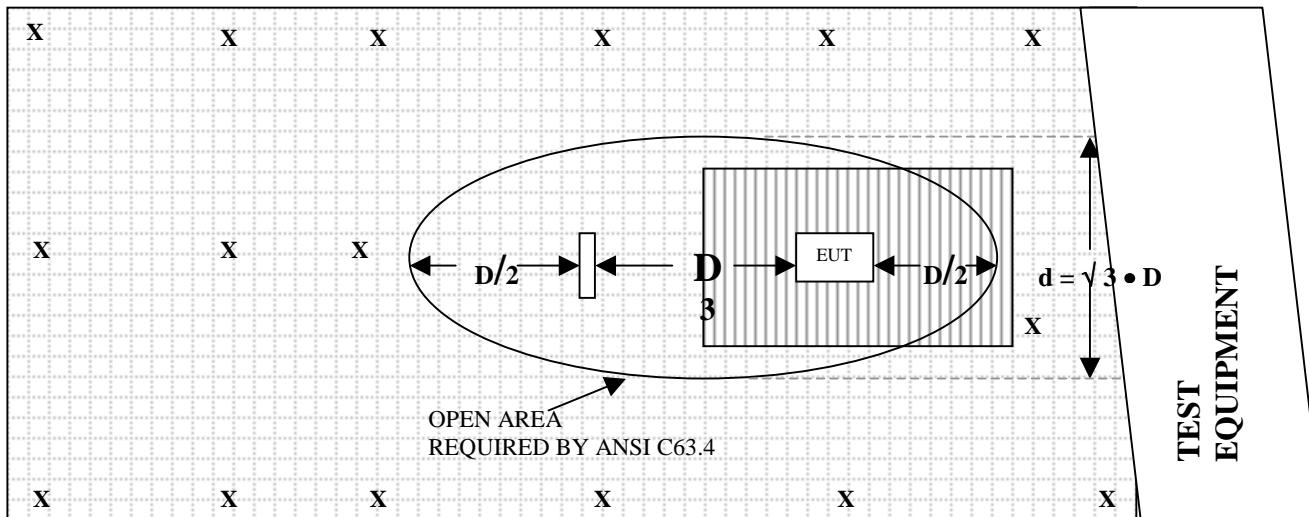
**Silverado Division**  
**19121 El Toro Road**  
**Silverado, CA 92676**  
**(949) 589-0700**

**Lake Forest Division**  
**20621 Pascal Way**  
**Lake Forest, CA 92630**  
**(949) 587-0400**

**FIGURE 1: CONDUCTED EMISSIONS TEST SETUP**


**FIGURE 2: PLOT MAP AND LAYOUT OF RADIATED SITE – 3 METERS**

OPEN LAND > 15 METERS



OPEN LAND > 15 METERS

|  |   |
|--|---|
|  = GROUND RODS            |  = GROUND SCREEN |
|  = TEST DISTANCE (meters) |  = WOOD COVER    |

**COM-POWER AB-900**
**BICONICAL ANTENNA**
**S/N: 15250**
**CALIBRATION DATE: FEBRUARY 23, 2009**

| <b>FREQUENCY<br/>(MHz)</b> | <b>FACTOR<br/>(dB)</b> | <b>FREQUENCY<br/>(MHz)</b> | <b>FACTOR<br/>(dB)</b> |
|----------------------------|------------------------|----------------------------|------------------------|
| 30                         | 13.0                   | 100                        | 11.1                   |
| 35                         | 11.1                   | 120                        | 13.6                   |
| 40                         | 10.2                   | 140                        | 12.4                   |
| 45                         | 11.2                   | 160                        | 12.9                   |
| 50                         | 11.6                   | 180                        | 16.5                   |
| 60                         | 9.1                    | 200                        | 17.0                   |
| 70                         | 8.4                    | 250                        | 16.3                   |
| 80                         | 6.2                    | 275                        | 18.2                   |
| 90                         | 8.5                    | 300                        | 17.9                   |

**COM-POWER AL-100****LOG PERIODIC ANTENNA****S/N: 16060****CALIBRATION DATE: JUNE 15, 2009**

| <b>FREQUENCY<br/>(MHz)</b> | <b>FACTOR<br/>(dB)</b> | <b>FREQUENCY<br/>(MHz)</b> | <b>FACTOR<br/>(dB)</b> |
|----------------------------|------------------------|----------------------------|------------------------|
| 300                        | 14.2                   | 700                        | 20.1                   |
| 400                        | 15.9                   | 800                        | 21.2                   |
| 500                        | 17.1                   | 900                        | 21.3                   |
| 600                        | 18.8                   | 1000                       | 22.3                   |

**COM POWER AH-118**
**HORN ANTENNA**
**S/N: 071175**
**CALIBRATION DATE: JUNE 27, 2008**

| <b>FREQUENCY<br/>(GHz)</b> | <b>FACTOR<br/>(dB)</b> | <b>FREQUENCY<br/>(GHz)</b> | <b>FACTOR<br/>(dB)</b> |
|----------------------------|------------------------|----------------------------|------------------------|
| 1.0                        | 24.5                   | 10.0                       | 39.4                   |
| 1.5                        | 25.4                   | 10.5                       | 39.7                   |
| 2.0                        | 28.3                   | 11.0                       | 39.0                   |
| 2.5                        | 28.9                   | 11.5                       | 40.0                   |
| 3.0                        | 29.7                   | 12.0                       | 39.7                   |
| 3.5                        | 30.8                   | 12.5                       | 41.7                   |
| 4.0                        | 31.4                   | 13.0                       | 42.7                   |
| 4.5                        | 32.6                   | 13.5                       | 41.2                   |
| 5.0                        | 33.7                   | 14.0                       | 41.6                   |
| 5.5                        | 34.4                   | 14.5                       | 43.2                   |
| 6.0                        | 34.7                   | 15.0                       | 42.3                   |
| 6.5                        | 35.4                   | 15.5                       | 39.3                   |
| 7.0                        | 37.0                   | 16.0                       | 41.7                   |
| 7.5                        | 37.4                   | 16.5                       | 39.6                   |
| 8.0                        | 37.6                   | 17.0                       | 43.0                   |
| 8.5                        | 37.6                   | 17.5                       | 47.1                   |
| 9.0                        | 38.5                   | 18.0                       | 46.2                   |
| 9.5                        | 38.6                   |                            |                        |

# COM-POWER PA-102

## PREAMPLIFIER

S/N: 1017

CALIBRATION DATE: JANUARY 12, 2009

| FREQUENCY<br>(MHz) | FACTOR<br>(dB) | FREQUENCY<br>(MHz) | FACTOR<br>(dB) |
|--------------------|----------------|--------------------|----------------|
| 30                 | 39.0           | 300                | 38.8           |
| 40                 | 39.0           | 350                | 38.8           |
| 50                 | 38.8           | 400                | 38.7           |
| 60                 | 38.7           | 450                | 38.6           |
| 70                 | 38.8           | 500                | 38.3           |
| 80                 | 38.8           | 550                | 38.9           |
| 90                 | 39.1           | 600                | 38.4           |
| 100                | 39.1           | 650                | 38.8           |
| 125                | 38.9           | 700                | 38.4           |
| 150                | 38.9           | 750                | 38.5           |
| 175                | 38.9           | 800                | 38.3           |
| 200                | 38.8           | 850                | 38.4           |
| 225                | 39.0           | 900                | 38.1           |
| 250                | 38.9           | 950                | 37.4           |
| 275                | 38.8           | 1000               | 38.1           |

# COM-POWER PA-122

## PREAMPLIFIER

S/N: 181921

CALIBRATION DATE: MARCH 12, 2009

| FREQUENCY<br>(GHz) | FACTOR<br>(dB) | FREQUENCY<br>(GHz) | FACTOR<br>(dB) |
|--------------------|----------------|--------------------|----------------|
| 1.0                | 36.46          | 10.0               | 35.06          |
| 1.5                | 35.36          | 10.5               | 34.82          |
| 2.0                | 34.76          | 11.0               | 33.12          |
| 2.5                | 34.94          | 11.5               | 34.33          |
| 3.0                | 34.59          | 12.0               | 34.75          |
| 3.5                | 34.55          | 12.5               | 33.94          |
| 4.0                | 34.25          | 13.0               | 35.50          |
| 4.5                | 33.89          | 13.5               | 34.89          |
| 5.0                | 34.22          | 14.0               | 36.56          |
| 5.5                | 34.81          | 14.5               | 36.06          |
| 6.0                | 35.74          | 15.0               | 36.67          |
| 6.5                | 36.51          | 15.5               | 36.84          |
| 7.0                | 36.66          | 16.0               | 34.31          |
| 7.5                | 35.72          | 16.5               | 35.11          |
| 8.0                | 33.28          | 17.0               | 35.35          |
| 8.5                | 33.11          | 17.5               | 34.11          |
| 9.0                | 34.71          | 18.0               | 33.88          |
| 9.5                | 35.50          | 18.5               | 32.20          |

**COM-POWER AL-130**
**LOOP ANTENNA**
**S/N: 17089**
**CALIBRATION DATE: SEPTEMBER 29, 2008**

| <b>FREQUENCY<br/>(MHz)</b> | <b>MAGNETIC<br/>(dB/m)</b> | <b>ELECTRIC<br/>(dB/m)</b> |
|----------------------------|----------------------------|----------------------------|
| 0.009                      | -41.57                     | 9.93                       |
| 0.01                       | -42.06                     | 9.44                       |
| 0.02                       | -42.43                     | 9.07                       |
| 0.05                       | -42.50                     | 9.00                       |
| 0.07                       | -42.10                     | 9.40                       |
| 0.1                        | -42.03                     | 9.47                       |
| 0.2                        | -44.50                     | 7.00                       |
| 0.3                        | -41.93                     | 9.57                       |
| 0.5                        | -41.90                     | 9.60                       |
| 0.7                        | -41.73                     | 9.77                       |
| 1                          | -41.23                     | 10.27                      |
| 2                          | -40.90                     | 10.60                      |
| 3                          | -41.20                     | 10.30                      |
| 4                          | -41.30                     | 10.20                      |
| 5                          | -40.70                     | 10.80                      |
| 10                         | -41.10                     | 10.40                      |
| 15                         | -42.17                     | 9.33                       |
| 20                         | -42.00                     | 9.50                       |
| 25                         | -42.20                     | 9.30                       |
| 30                         | -43.10                     | 8.40                       |

**FRONT VIEW**

CRAFCO, INC.  
TRIGGER TRANSMITTER  
MODEL: 51817  
FCC SUBPART B AND C – RADIATED EMISSIONS

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION  
FOR MAXIMUM EMISSIONS**

---

Brea Division  
114 Olinda Drive  
Brea, CA 92823  
(714) 579-0500

Agoura Division  
2337 Troutdale Drive  
Agoura, CA 91301  
(818) 597-0600

Silverado Division  
19121 El Toro Road  
Silverado, CA 92676  
(949) 589-0700

Lake Forest Division  
20621 Pascal Way  
Lake Forest, CA 92630  
(949) 587-0400

**REAR VIEW**

CRAFCO, INC.  
TRIGGER TRANSMITTER  
MODEL: 51817  
FCC SUBPART B AND C – RADIATED EMISSIONS

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION  
FOR MAXIMUM EMISSIONS**

---

Brea Division  
114 Olinda Drive  
Brea, CA 92823  
(714) 579-0500

Agoura Division  
2337 Troutdale Drive  
Agoura, CA 91301  
(818) 597-0600

Silverado Division  
19121 El Toro Road  
Silverado, CA 92676  
(949) 589-0700

Lake Forest Division  
20621 Pascal Way  
Lake Forest, CA 92630  
(949) 587-0400

## APPENDIX E

### ***DATA SHEETS***

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**Brea Division**  
**114 Olinda Drive**  
**Brea, CA 92823**  
**(714) 579-0500**

**Agoura Division**  
**2337 Troutdale Drive**  
**Agoura, CA 91301**  
**(818) 597-0600**

**Silverado Division**  
**19121 El Toro Road**  
**Silverado, CA 92676**  
**(949) 589-0700**

**Lake Forest Division**  
**20621 Pascal Way**  
**Lake Forest, CA 92630**  
**(949) 587-0400**

***RADIATED EMISISONS***

***DATA SHEETS***

---

**Brea Division**  
**114 Olinda Drive**  
**Brea, CA 92823**  
**(714) 579-0500**

**Agoura Division**  
**2337 Troutdale Drive**  
**Agoura, CA 91301**  
**(818) 597-0600**

**Silverado Division**  
**19121 El Toro Road**  
**Silverado, CA 92676**  
**(949) 589-0700**

**Lake Forest Division**  
**20621 Pascal Way**  
**Lake Forest, CA 92630**  
**(949) 587-0400**

**FCC 15.231**

Crafco, Inc.  
Trigger Transmitter  
Model: 51817

Date: 11/06/09  
Labs: B and D  
Tested By: Kyle Fujimoto

**X-Axis**
**Duty Cycle = 45.28%**

| Freq.<br>(MHz) | Level<br>(dBuV) | Pol (v/h) | Limit | Margin  | Peak /<br>QP /<br>Avg | Ant.<br>Height<br>(m) | Table<br>Angle<br>(deg) | Comments |
|----------------|-----------------|-----------|-------|---------|-----------------------|-----------------------|-------------------------|----------|
| 315            | 70.45           | V         | 95.6  | -25.15  | Peak                  | 2.5                   | 135                     |          |
| 315            | 63.5681         | V         | 75.6  | -12.032 | Avg                   | 2.5                   | 135                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 630            | 36.79           | V         | 75.6  | -38.81  | Peak                  | 1.25                  | 135                     |          |
| 630            | 29.9081         | V         | 55.6  | -25.692 | Avg                   | 1.25                  | 135                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 945            | 35.18           | V         | 75.6  | -40.42  | Peak                  | 2.23                  | 150                     |          |
| 945            | 28.2981         | V         | 55.6  | -27.302 | Avg                   | 2.23                  | 150                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 1260           | 38.31           | V         | 75.6  | -37.29  | Peak                  | 2.87                  | 150                     |          |
| 1260           | 31.4281         | V         | 55.6  | -24.172 | Avg                   | 2.87                  | 150                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 1575           | 45.77           | V         | 74    | -28.23  | Peak                  | 1.75                  | 225                     |          |
| 1575           | 38.8881         | V         | 54    | -15.112 | Avg                   | 1.75                  | 225                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 1890           | 50.34           | V         | 75.6  | -25.26  | Peak                  | 1.65                  | 155                     |          |
| 1890           | 43.4581         | V         | 55.6  | -12.142 | Avg                   | 1.65                  | 155                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 2205           | 48.49           | V         | 74    | -25.51  | Peak                  | 1.77                  | 150                     |          |
| 2205           | 41.6081         | V         | 54    | -12.392 | Avg                   | 1.77                  | 150                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 2520           | 44.82           | V         | 75.6  | -30.78  | Peak                  | 2.14                  | 135                     |          |
| 2520           | 37.9381         | V         | 55.6  | -17.662 | Avg                   | 2.14                  | 135                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 2835           | 46.49           | V         | 74    | -27.51  | Peak                  | 2.14                  | 150                     |          |
| 2835           | 39.6081         | V         | 54    | -14.392 | Avg                   | 2.14                  | 150                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 3150           | 40.45           | V         | 75.6  | -35.15  | Peak                  | 2.14                  | 150                     |          |
| 3150           | 33.5681         | V         | 55.6  | -22.032 | Avg                   | 2.14                  | 150                     |          |
|                |                 |           |       |         |                       |                       |                         |          |

**FCC 15.231**

Crafco, Inc.  
Trigger Transmitter  
Model: 51817

Date: 11/06/09  
Labs: B and D  
Tested By: Kyle Fujimoto

**Y-Axis**
**Duty Cycle = 45.28%**

| Freq.<br>(MHz) | Level<br>(dBuV) | Pol (v/h) | Limit | Margin  | Peak /<br>QP /<br>Avg | Ant.<br>Height<br>(m) | Table<br>Angle<br>(deg) | Comments |
|----------------|-----------------|-----------|-------|---------|-----------------------|-----------------------|-------------------------|----------|
| 315            | 75.15           | V         | 95.6  | -20.45  | Peak                  | 1.5                   | 180                     |          |
| 315            | 68.2681         | V         | 75.6  | -7.3319 | Avg                   | 1.5                   | 180                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 630            | 44.19           | V         | 75.6  | -31.41  | Peak                  | 2                     | 180                     |          |
| 630            | 37.3081         | V         | 55.6  | -18.292 | Avg                   | 2                     | 180                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 945            | 39.68           | V         | 75.6  | -35.92  | Peak                  | 1                     | 225                     |          |
| 945            | 32.7981         | V         | 55.6  | -22.802 | Avg                   | 1                     | 225                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 1260           | 38.78           | V         | 75.6  | -36.82  | Peak                  | 2.05                  | 155                     |          |
| 1260           | 31.8981         | V         | 55.6  | -23.702 | Avg                   | 2.05                  | 155                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 1575           | 45.53           | V         | 74    | -28.47  | Peak                  | 1.25                  | 135                     |          |
| 1575           | 38.6481         | V         | 54    | -15.352 | Avg                   | 1.25                  | 135                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 1890           | 56.36           | V         | 75.6  | -19.24  | Peak                  | 1.75                  | 180                     |          |
| 1890           | 49.4781         | V         | 55.6  | -6.1219 | Avg                   | 1.75                  | 180                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 2205           | 58.24           | V         | 74    | -15.76  | Peak                  | 1.65                  | 195                     |          |
| 2205           | 51.3581         | V         | 54    | -2.6419 | Avg                   | 1.65                  | 195                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 2520           | 51.92           | V         | 75.6  | -23.68  | Peak                  | 1.95                  | 135                     |          |
| 2520           | 45.0381         | V         | 55.6  | -10.562 | Avg                   | 1.95                  | 135                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 2835           | 55.13           | V         | 74    | -18.87  | Peak                  | 1.22                  | 175                     |          |
| 2835           | 48.2481         | V         | 54    | -5.7519 | Avg                   | 1.22                  | 175                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 3150           | 44.04           | V         | 75.6  | -31.56  | Peak                  | 1.25                  | 90                      |          |
| 3150           | 37.1581         | V         | 55.6  | -18.442 | Avg                   | 1.25                  | 90                      |          |
|                |                 |           |       |         |                       |                       |                         |          |

**FCC 15.231**

Crafco, Inc.  
Trigger Transmitter  
Model: 51817

Date: 11/06/09  
Labs: B and D  
Tested By: Kyle Fujimoto

**Z-Axis**
**Duty Cycle = 45.28%**

| Freq.<br>(MHz) | Level<br>(dBuV) | Pol (v/h) | Limit | Margin  | Peak /<br>QP /<br>Avg | Ant.<br>Height<br>(m) | Table<br>Angle<br>(deg) | Comments |
|----------------|-----------------|-----------|-------|---------|-----------------------|-----------------------|-------------------------|----------|
| 315            | 74.65           | V         | 95.6  | -20.95  | Peak                  | 1.5                   | 180                     |          |
| 315            | 67.7681         | V         | 75.6  | -7.8319 | Avg                   | 1.5                   | 180                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 630            | 36.29           | V         | 75.6  | -39.31  | Peak                  | 2                     | 180                     |          |
| 630            | 29.4081         | V         | 55.6  | -26.192 | Avg                   | 2                     | 180                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 945            | 34.28           | V         | 75.6  | -41.32  | Peak                  | 1                     | 225                     |          |
| 945            | 27.3981         | V         | 55.6  | -28.202 | Avg                   | 1                     | 225                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 1260           | 38.08           | V         | 75.6  | -37.52  | Peak                  | 1.75                  | 135                     |          |
| 1260           | 31.1981         | V         | 55.6  | -24.402 | Avg                   | 1.75                  | 135                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 1575           | 43.43           | V         | 74    | -30.57  | Peak                  | 1.25                  | 135                     |          |
| 1575           | 36.5481         | V         | 54    | -17.452 | Avg                   | 1.25                  | 135                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 1890           | 48.99           | V         | 75.6  | -26.61  | Peak                  | 1.68                  | 175                     |          |
| 1890           | 42.1081         | V         | 55.6  | -13.492 | Avg                   | 1.68                  | 175                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 2205           | 47.95           | V         | 74    | -26.05  | Peak                  | 1.35                  | 155                     |          |
| 2205           | 41.0681         | V         | 54    | -12.932 | Avg                   | 1.35                  | 155                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 2520           | 45.64           | V         | 75.6  | -29.96  | Peak                  | 1.85                  | 135                     |          |
| 2520           | 38.7581         | V         | 55.6  | -16.842 | Avg                   | 1.85                  | 135                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 2835           | 48.91           | V         | 74    | -25.09  | Peak                  | 1.22                  | 175                     |          |
| 2835           | 42.0281         | V         | 54    | -11.972 | Avg                   | 1.22                  | 175                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 3150           | 45.96           | V         | 75.6  | -29.64  | Peak                  | 1.25                  | 90                      |          |
| 3150           | 39.0781         | V         | 55.6  | -16.522 | Avg                   | 1.25                  | 90                      |          |
|                |                 |           |       |         |                       |                       |                         |          |

**FCC 15.231**

Crafco, Inc.  
Trigger Transmitter  
Model: 51817

Date: 11/06/09  
Labs: B and D  
Tested By: Kyle Fujimoto

**X-Axis**
**Duty Cycle = 45.28%**

| Freq.<br>(MHz) | Level<br>(dBuV) | Pol (v/h) | Limit | Margin  | Peak /<br>QP /<br>Avg | Ant.<br>Height<br>(m) | Table<br>Angle<br>(deg) | Comments |
|----------------|-----------------|-----------|-------|---------|-----------------------|-----------------------|-------------------------|----------|
| 315            | 79.75           | H         | 95.6  | -15.85  | Peak                  | 1.5                   | 180                     |          |
| 315            | 72.8681         | H         | 75.6  | -2.7319 | Avg                   | 1.5                   | 180                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 630            | 46.69           | H         | 75.6  | -28.91  | Peak                  | 2                     | 180                     |          |
| 630            | 39.8081         | H         | 55.6  | -15.792 | Avg                   | 2                     | 180                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 945            | 35.98           | H         | 75.6  | -39.62  | Peak                  | 1.96                  | 225                     |          |
| 945            | 29.0981         | H         | 55.6  | -26.502 | Avg                   | 1.96                  | 225                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 1260           | 43.02           | H         | 75.6  | -32.58  | Peak                  | 3.01                  | 90                      |          |
| 1260           | 36.1381         | H         | 55.6  | -19.462 | Avg                   | 3.01                  | 90                      |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 1575           | 47.93           | H         | 74    | -26.07  | Peak                  | 2.24                  | 150                     |          |
| 1575           | 41.0481         | H         | 54    | -12.952 | Avg                   | 2.24                  | 150                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 1890           | 52.59           | H         | 75.6  | -23.01  | Peak                  | 2.38                  | 315                     |          |
| 1890           | 45.7081         | H         | 55.6  | -9.8919 | Avg                   | 2.38                  | 315                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 2205           | 49.45           | H         | 74    | -24.55  | Peak                  | 1.25                  | 135                     |          |
| 2205           | 42.5681         | H         | 54    | -11.432 | Avg                   | 1.25                  | 135                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 2520           | 49.76           | H         | 75.6  | -25.84  | Peak                  | 1.35                  | 150                     |          |
| 2520           | 42.8781         | H         | 55.6  | -12.722 | Avg                   | 1.35                  | 150                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 2835           | 51.06           | H         | 74    | -22.94  | Peak                  | 2.05                  | 135                     |          |
| 2835           | 44.1781         | H         | 54    | -9.8219 | Avg                   | 2.05                  | 135                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 3150           | 40.33           | H         | 75.6  | -35.27  | Peak                  | 1.25                  | 90                      |          |
| 3150           | 33.4481         | H         | 55.6  | -22.152 | Avg                   | 1.25                  | 90                      |          |
|                |                 |           |       |         |                       |                       |                         |          |

**FCC 15.231**

Crafco, Inc.  
Trigger Transmitter  
Model: 51817

Date: 11/06/09  
Labs: B and D  
Tested By: Kyle Fujimoto

**Y-Axis**
**Duty Cycle = 45.28%**

| Freq.<br>(MHz) | Level<br>(dBuV) | Pol (v/h) | Limit | Margin  | Peak /<br>QP /<br>Avg | Ant.<br>Height<br>(m) | Table<br>Angle<br>(deg) | Comments |
|----------------|-----------------|-----------|-------|---------|-----------------------|-----------------------|-------------------------|----------|
| 315            | 68.95           | H         | 95.6  | -26.65  | Peak                  | 1.5                   | 180                     |          |
| 315            | 62.0681         | H         | 75.6  | -13.532 | Avg                   | 1.5                   | 180                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 630            | 32.29           | H         | 75.6  | -43.31  | Peak                  | 2                     | 180                     |          |
| 630            | 25.4081         | H         | 55.6  | -30.192 | Avg                   | 2                     | 180                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 945            | 30.98           | H         | 75.6  | -44.62  | Peak                  | 1.89                  | 315                     |          |
| 945            | 24.0981         | H         | 55.6  | -31.502 | Avg                   | 1.89                  | 315                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 1260           | 35.37           | H         | 75.6  | -40.23  | Peak                  | 2.23                  | 150                     |          |
| 1260           | 28.4881         | H         | 55.6  | -27.112 | Avg                   | 2.23                  | 150                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 1575           | 40.85           | H         | 74    | -33.15  | Peak                  | 2.08                  | 135                     |          |
| 1575           | 33.9681         | H         | 54    | -20.032 | Avg                   | 2.08                  | 135                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 1890           | 49.62           | H         | 75.6  | -25.98  | Peak                  | 2.34                  | 150                     |          |
| 1890           | 42.7381         | H         | 55.6  | -12.862 | Avg                   | 2.34                  | 150                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 2205           | 48.92           | H         | 74    | -25.08  | Peak                  | 3.05                  | 165                     |          |
| 2205           | 42.0381         | H         | 54    | -11.962 | Avg                   | 3.05                  | 165                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 2520           | 45.94           | H         | 75.6  | -29.66  | Peak                  | 1.65                  | 175                     |          |
| 2520           | 39.0581         | H         | 55.6  | -16.542 | Avg                   | 1.65                  | 175                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 2835           | 49.96           | H         | 74    | -24.04  | Peak                  | 1.69                  | 135                     |          |
| 2835           | 43.0781         | H         | 54    | -10.922 | Avg                   | 1.69                  | 135                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 3150           | 50.52           | H         | 75.6  | -25.08  | Peak                  | 1.25                  | 90                      |          |
| 3150           | 43.6381         | H         | 55.6  | -11.962 | Avg                   | 1.25                  | 90                      |          |
|                |                 |           |       |         |                       |                       |                         |          |

**FCC 15.231**

Crafco, Inc.  
Trigger Transmitter  
Model: 51817

Date: 11/06/09  
Labs: B and D  
Tested By: Kyle Fujimoto

**Z-Axis**
**Duty Cycle = 45.28%**

| Freq.<br>(MHz) | Level<br>(dBuV) | Pol (v/h) | Limit | Margin  | Peak /<br>QP /<br>Avg | Ant.<br>Height<br>(m) | Table<br>Angle<br>(deg) | Comments |
|----------------|-----------------|-----------|-------|---------|-----------------------|-----------------------|-------------------------|----------|
| 315            | 77.65           | H         | 95.6  | -17.95  | Peak                  | 1.5                   | 180                     |          |
| 315            | 70.7681         | H         | 75.6  | -4.8319 | Avg                   | 1.5                   | 180                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 630            | 45.19           | H         | 75.6  | -30.41  | Peak                  | 2                     | 180                     |          |
| 630            | 38.3081         | H         | 55.6  | -17.292 | Avg                   | 2                     | 180                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 945            | 38.48           | H         | 75.6  | -37.12  | Peak                  | 1                     | 225                     |          |
| 945            | 31.5981         | H         | 55.6  | -24.002 | Avg                   | 1                     | 225                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 1260           | 37.38           | H         | 75.6  | -38.22  | Peak                  | 1.75                  | 135                     |          |
| 1260           | 30.4981         | H         | 55.6  | -25.102 | Avg                   | 1.75                  | 135                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 1575           | 41.63           | H         | 74    | -32.37  | Peak                  | 1.35                  | 155                     |          |
| 1575           | 34.7481         | H         | 54    | -19.252 | Avg                   | 1.35                  | 155                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 1890           | 46.72           | H         | 75.6  | -28.88  | Peak                  | 1.85                  | 195                     |          |
| 1890           | 39.8381         | H         | 55.6  | -15.762 | Avg                   | 1.85                  | 195                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 2205           | 52.56           | H         | 74    | -21.44  | Peak                  | 1.35                  | 155                     |          |
| 2205           | 45.6781         | H         | 54    | -8.3219 | Avg                   | 1.35                  | 155                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 2520           | 47.07           | H         | 75.6  | -28.53  | Peak                  | 1.95                  | 135                     |          |
| 2520           | 40.1881         | H         | 55.6  | -15.412 | Avg                   | 1.95                  | 135                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 2835           | 50.99           | H         | 74    | -23.01  | Peak                  | 1.35                  | 135                     |          |
| 2835           | 44.1081         | H         | 54    | -9.8919 | Avg                   | 1.35                  | 135                     |          |
|                |                 |           |       |         |                       |                       |                         |          |
| 3150           | 43.32           | H         | 75.6  | -32.28  | Peak                  | 1.25                  | 90                      |          |
| 3150           | 36.4381         | H         | 55.6  | -19.162 | Avg                   | 1.25                  | 90                      |          |
|                |                 |           |       |         |                       |                       |                         |          |



# COMPATIBLE ELECTRONICS

Report Number: **B91106D1**

**FCC Part 15 Subpart B and FCC Section 15.231 Test Report**

*Trigger Transmitter*  
*Model: 51817*

Page E9

FCC 15.231 and FCC Class B

Crafco, Inc.  
Trigger Transmitter  
Model: 51817

Date: 11/06/09  
Labs: B and D  
Tested By: Kyle Fujimoto

## Transmit Mode

**Duty Cycle = 45.28%**

## Digital Portion and Non-Harmonic Emissions from the Tx

## 10 kHz to 3200 MHz - Vertical and Horizontal Polarization

**Brea Division  
114 Olinda Drive  
Brea, CA 92823  
(714) 579-0500**

**Agoura Division  
2337 Troutdale Drive  
Agoura, CA 91301  
(818) 597-0600**

**Silverado Division  
19121 El Toro Road  
Silverado, CA 92676  
(949) 589-0700**

**Lake Forest Division  
20621 Pascal Way  
Lake Forest, CA 92630  
(949) 587-0400**

***-20 dB BANDWIDTH***

***DATA SHEETS***

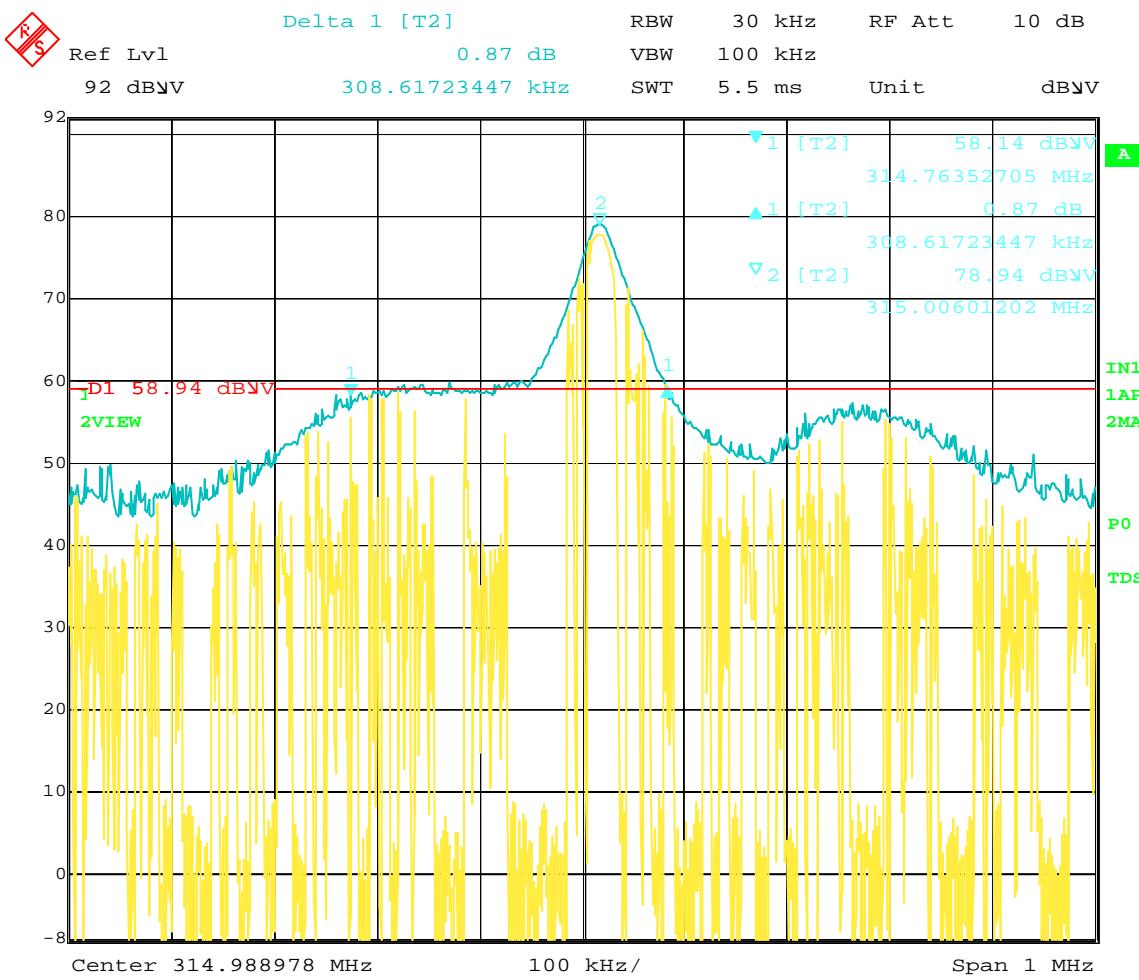
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**2337 Troutdale Drive**  
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**Lake Forest Division**  
**20621 Pascal Way**  
**Lake Forest, CA 92630**  
**(949) 587-0400**



Date: 6.NOV.2009 16:18:59

-20 dB Bandwidth of the Fundamental