

Exhibit B – Test Report
Hetronic
FBTX-01 - Transmitter

Project Number: 03400-10

Prepared for:
HETRONIC
401 East Memorial Road. Ste. 300
Oklahoma City, OK

By
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May 2003

CERTIFICATION
Electromagnetic Interference
Test Report

HETRONIC
FBTX-01 TRANSMITTER
(Transmitter Portion)

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THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL OF PROFESSIONAL TESTING (EMI), INC.



Certificate of Compliance

Applicant: Hetronic
 Applicant's Address: 401 East Memorial Road. Ste. 300
 Oklahoma City, OK
 Model: FBTX-01 Transmitter
 Serial Number:
 Project Number: 03400-10

The **Hetronic FBTX-01 Transmitter** was tested to and found to be in compliance with FCC Part 15.203, 15.209, and 15.249 for Intentional Radiators.

The highest average emissions generated by the above equipments are listed below:

	<u>Frequency (MHz)</u>	<u>Level (dBμV/m)</u>	<u>Limit (dBμV/m)</u>	<u>Margin (dB)</u>
Peak Fundamental	915.7	80.2	94	-13.8
harmonics	5494.2	48.7	54	-5.3

I, Jeffrey A. Lenk, for Professional Testing (EMI), Inc., being familiar with the FCC rules and test procedures have reviewed the test setup, measured data and this report. I believe them to be true and accurate.

Jeffrey A. Lenk
 President

1.0 EUT Description

The FBTX-01 is a UHF FM-narrow band transmitter module (a factory installed subassembly) with PLL controlled oscillator for high frequency stability. It transmits simple FSK-based control data at 4800 baud to a receiver that actuates industrial cranes and associated equipment.

The EUT operates on one of six factory-set frequencies near 915 MHz and is designed for compliance with 47 CFR 15.249 of the FCC rules. The frequencies are given below.

915.6 MHz
 915.650 MHz
 915.7 MHz
 915.750 MHz
 915.825 MHz

Specific test requirements for the devices include the following:

47 CFR 15.249	Fundamental and Harmonic Radiated Power
47 CFR 15.209	General Radiated Emission Limits
47 CFR 15.203	Antenna Requirement

The system tested consisted of the following:

<u>Manufacturer & Model</u>	<u>Serial #</u>	<u>FCC ID #</u>	<u>Description</u>
Hetronic FBTX-01 Transmitter	None	None	Portable hand-held or clothing-affixed remote control unit, actuated by key lock and a small array of membrane keys.

System Peripherals

None.

1.1 EUT Operation

The **FBTX-01 Transmitter** was operated in it's host device, a portable battery-operated system generally held or attached to the operator's clothing. Switching on the device allowed it to continuously transmit a FSK data pattern in a one-way fashion to a receiver. The receiver was used to monitor and insure the transmitter was operating correctly.

2.0 Electromagnetic Emissions Testing

Professional Testing (EMI), Inc. (PTI), follows the guidelines of NIST for all uncertainty calculations, estimates and expressions thereof for EMC testing.

2.1 Conducted Emissions Measurements

Conducted emissions were not measured. The EUT operates strictly from battery power. The battery must be removed and placed into a dedicated charger to charge. The transmitter cannot be operated and the battery charged simultaneously. This test is not required.

2.2 Radiated Emissions Measurements

The alternate procedure allowing measurement of antenna port conducted emissions were made of the Fundamental and Spurious Emission levels of the **Hetronic FBTX-01 Transmitter**.

Measurements of the maximum emission levels for the fundamental and the spurious/harmonic emissions of the transmitter were made at the Professional Testing "Open Field" Site 3, located in Round Rock, Texas. A "Description of Measurement Facilities" has been submitted to the FCC and approved pursuant to Section 2.948 of CFR 47 of the FCC rules.

2.2.1 Test Procedure

The following testing procedure was applied to the EUT mentioned above.

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The table was centered on a motorized turntable, which allows 360-degree rotation. For measurements of the fundamental signal, a measurement antenna was positioned at a distance of 3 meters as measured from the closest point of the EUT. For spurious/harmonic measurements above 1 GHz, the measurement antenna was placed 3 meters from the EUT. The radiated emissions were maximized by energizing the EUT and by rotating the EUT.

A Spectrum Analyzer with peak detection was used to find the maximums of the radiated emissions during the variability testing. A drawing showing the test setup is given as Figure 1.

2.2.2 Test Criteria

The table below shows FCC Part 15 radiated limits for an intentional radiator operating at 902 to 928 MHz. In addition to these requirements, the EUT must meet the restricted emission band requirements of §15.209. The spurious measurements of the harmonics were performed to the 10th harmonic of the fundamental.

<u>Signal Type</u>	<u>Frequency (MHz)</u>	<u>3 m Limit Per §15.249 or §15.209</u>	<u>Field Strength (dB uV/m)</u>
Fundamental	915.7	50 mV/m	94
2 nd Harmonic	1831.4	500 µV/m	54
3 rd Harmonic	2747.1	500 µV/m	54
4 th Harmonic	3662.8	500 µV/m	54
5 th Harmonic	4578.5	500 µV/m	54
6 th Harmonic	5494.2	500 µV/m	54
7 th Harmonic	6409.9	500 µV/m	54
8 th Harmonic	7325.6	500 µV/m	54
9 th Harmonic	8241.3	500 µV/m	54
10 th Harmonic	9157	500 µV/m	54

2.2.3 Test Results

The fundamental was measured on a 3 meter OATS. The alternate measurement method (conducted emission at the antenna port) was employed for harmonic emission measurements.

The transmitter is physically very small, so a preliminary scan was done in a large GTEM to identify radiated emissions for the OATS. The only emission of note was the transmitter fundamental and harmonics.

The transmitter emissions were measured as radiated emissions and are included in Appendix A. The emissions were maximized at each frequency and measured using peak detection. The maximum measured fundamental emission was 80.2 dB µV/m, well under the limit.

The radiated emissions generated by the Hetronic FBTX-01 Transmitter are below the FCC Part 15 maximum emission criteria.

2.3 Occupied Bandwidth Measurements

Per §15.249 measurements of occupied bandwidth for the fundamental signals of the EUT are not required. To prevent out of band emissions the manufacturer selected operating frequencies near the center of the band.

3.0 Antenna Requirement

An analysis of the **Hetronic FBTX-01 Transmitter** was performed to determine compliance with Section 15.203 of the Rules. This section requires specific handling and control of antennas used for devices subject to regulations under the Intentional Radiator portions of Part 15.

3.1 Evaluation Procedure

The structure and application of the **Hetronic FBTX-01 Transmitter** were analyzed with respect to the rules. The antenna for this unit is an internal antenna. An auxiliary antenna port is not present.

3.2 Evaluation Criteria

Section 15.203 of the rules states that the subject device must meet at least one of the following criteria:

- (a) Antenna be permanently attached to the unit.
- (b) Antenna must use a unique type of connector to attach to the EUT.
- (c) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

3.3 Evaluation Results

The **Hetronic FBTX-01 Transmitter** meets the criteria of this rule by virtue of having an internal antenna connector of unique style, located inside the enclosure. There is no means of relocating the antenna externally without seriously compromising the intrinsic safety feature of this industrial device. The EUT is therefore compliant with §15.203.

4.0 RF Safety

This device transmits with 1 to 3 mW of RF power, and could be operated within 5 cm of the body (generally the waist. Measurements on the transmitter confirmed its output at 3.0 mW. It is coupled to curved wire serving as a quarter-wave monopole radiator, and is folded parallel to the main circuit board.

The FCC safety criteria that invokes measurement of specific absorption rate (SAR), from OET Bulletin 65 Supplement C, is 300 mW for 915 MHz operating frequency. The power output of this transmitter is thus 1/100th of the threshold for RF safety concern, and therefore meets the requirements of FCC rules 2.1091 & 2.1093.

5.0 Modifications to Equipment

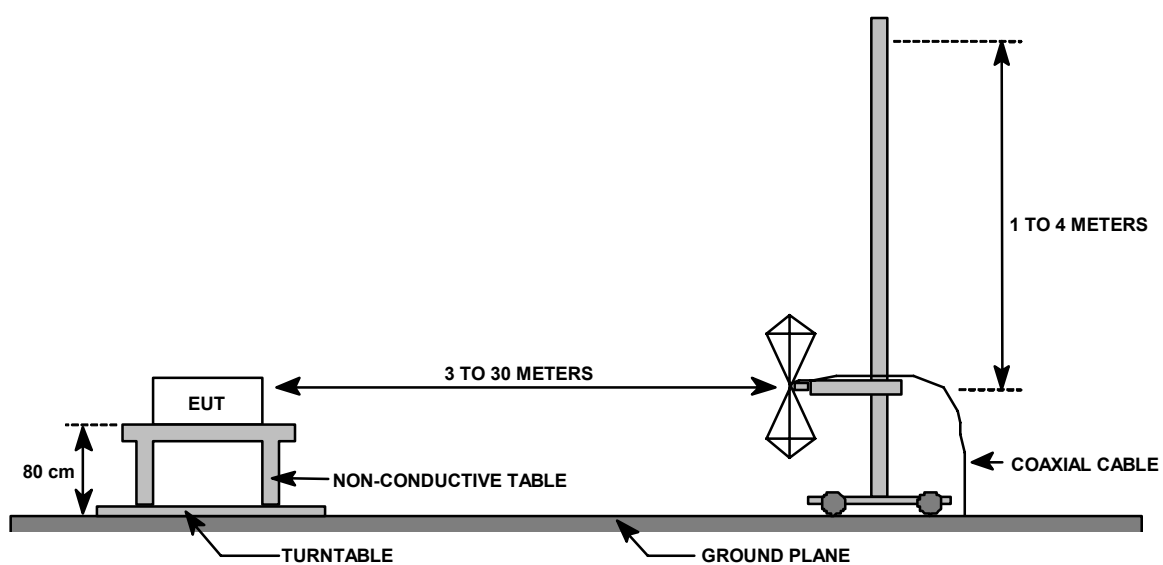
No modifications were made to the **Hetronic FBTX-01 Transmitter** during the testing process.

6.0 List of Test Equipment

A list of the test equipment utilized to perform the testing is given below. The date of calibration is given for each.

Electromagnetic Emissions Test Equipment

<u>Model</u>	<u>Description</u>	<u>Calibration Due</u>
HP8566B	Spectrum Analyzer	November 2003
Tektronix 2706	RF Preselector	December 2003
HP 8447D	Preamplifier	November 2003
Compliance Design B-100	Biconical Antenna	October 2003
EMCO 3115	Ridge Guide Antenna	July 2003
EMCO 3146	Log Periodic Antenna	July 2003
MITEQ	20 GHz Preamp	December 2003
Armored 10 meter microwave cable		June 2004

FIGURE 1: Radiated Emissions Test Setup

Appendix A **Emissions Data Sheets**

Antenna Port Conducted Data Sheet
Hetronic
FBTX-01 Transmitter

DATE: May 7, 2003
 PROJECT #: 03400-10

Conducted Antenna Port Emissions

Measured Transmit Power:	Fundamental (dBm)	Fundamental (mW)
	5.0	3.2

Conducted Emission Harmonic Levels Below Fundamental

Harmonic (MHz)	Measured Level (dBm)	dB Below Fundamental	Limit (dBc)	Margin (dB)
1831.40	-52.8	57.8	-50	7.8
2747.10	-78.4	83.4	-50	33.4
3662.80	-66.0	71.0	-50	21.0
4578.50	-82.8	87.8	-50	37.8
5494.20	-66.4	71.4	-50	21.4
6409.90	-83.2	88.2	-50	38.2
7325.60	-80.8	85.8	-50	35.8
8241.30	-85.6	90.6	-50	40.6
9157.00	-80.8	85.8	-50	35.8

Peak Radiated Data Sheet
Fundamental and Spurious Under 1 GHz
Hetronic
FBTX-01 Transmitter

DATE: May 27, 2003
 PROJECT #: 03400-10

DETECTOR FUNCTION: Quasi-Peak
 MEASUREMENT DISTANCE (m): 3

ANTENNA POLARIZATION: Horizontal

Freq. (MHz)	EUT Dir (Deg.)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (MHz) X	Margin (dB)
915.7	10	2	66.5	26.1	25.2	12.0	77.5	94	-16.5
915.7	260	2	63.5	26.1	25.2	12.0	74.5	94	-19.5
915.7	80	1	64.3	26.1	25.2	12.0	75.3	94	-18.7

ANTENNA POLARIZATION: Vertical

Freq. (MHz)	EUT Dir (Deg.)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
915.7	70	1	69.2	26.1	25.2	12.0	80.2	94	-13.8
915.7	66	1	68.5	26.1	25.2	12.0	79.5	94	-14.5
915.7	215	1	67.6	26.1	25.2	12.0	78.6	94	-15.4

Comment: Test Type FCC 15.249

Test Engineer: Eric Lifsey

Harmonics Radiated Data Sheet
Hetronic
FBTX-01 Transmitter

DATE: May 8, 2003
 PROJECT #: 03400-10

DETECTOR FUNCTION: Quasi-Peak
 MEASUREMENT DISTANCE (m): 3

Frequency MHz	Raw Meas*	Antenna Factor	Cable	Pre- amp	Corrected (dBm/m)	Converted (dBuV/m)	Limit (dB (dBuV/m)
1831.40	-67.2	27.2	1.0	33.0	-72.0	35.0	54
2747.10	-94.0	29.5	0.9	35.0	-98.6	8.4	54
3662.80	-59.2	31.8	1.0	33.6	-60.0	47.0	54
4578.50	-75.6	32.4	1.2	31.9	-73.9	33.1	54
5494.20	-64.0	35.0	1.5	30.8	-58.3	48.7	54
6409.90	-71.6	34.8	1.7	30.7	-65.8	41.2	54
7325.60	-71.6	36.8	3.1	30.2	-61.9	45.1	54
8241.30	-69.6	37.8	3.5	31.4	-59.7	47.3	54
9157.00	-76.8	37.9	2.8	31.2	-67.3	39.7	54

Comment: Emission limit over 1 GHz: 500 uV/m

Test Engineer: Eric Lifsey