

FCC PART 15.231  
EMI MEASUREMENT AND TEST REPORT  
FOR  
**WARN Industries Inc.**

13270 S.E. Pheasant Court Milwaukie, Oregon 97222 USA

**FCC ID: K3XWTX001**  
**Class II Permissive Change**

**Product Name:** Wireless Winch Controller

**Model No:** 74501

Sample  
**Received Date:** May 24 2007

Test  
**Performed Date:** May 25, 2007

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## GENERAL INFORMATION

### 1.1 Product Description for Equipment Under Test (EUT)

The *WARN Industries Inc.* 's Model: 74501 or the "EUT" as referred to in this report is a Wireless Winch Controller which measures approximately 47mmL x 17mmW x 93mmH, powered by DC 12V battery, operation frequency is 433.92MHz, the EUT had be accredited by FCC ID: K3XWTX001, but the circuit diagram is updated, The resistor R3 is updated from 200K to 47K, the change belong to Class II permissive change.

*\*The test data gathered are from production sample serial number 52796 provided by the manufacturer.*

### Objective

This document is a test report based on the Electromagnetic Interference (EMI) tests performed on the EUT. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4 - 2003.

The tests were performed in order to determine compliance with Part 2, Subpart J, FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209, and 15.231 rules.

### Related Submittal(s)/Grant(s)

No related submittal(s).

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, 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.

### Test Facility

All measurement facilities used to collect the data are located at Huatongwei Building , Keji Rd, 12 S, high-Tech Park, Nanshan District, Shenzhen, China.

The sites are constructed in conformance with the requirements of ANSI C63.7/634 and CISPR 22, the site was accredited by FCC (662850), A2LA (2243.01), IC (5377) and CNAL (L1225)

## SYSTEM TEST CONFIGURATION

### Justification

The system was configured for testing in a typical fashion (as normally used by a typical user).

### EUT Exercise Software

N/A

### Special Accessories

N/A

### Block Diagram

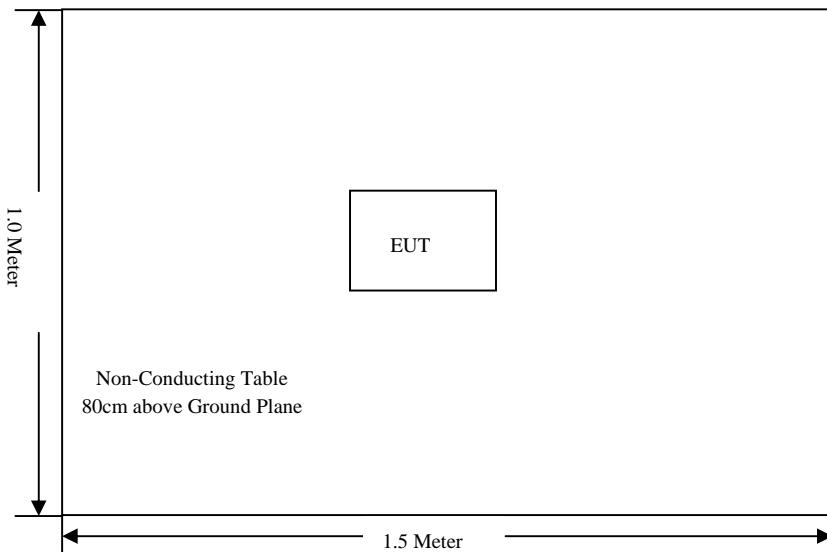
Please refer to the Appendix D.

### Equipment Modifications

No modifications were made by BEST Test Service (Shenzhen) Co., Ltd. to ensure EUT to comply with the applicable limits and requirements.

### Test Setup Block Diagram

The EUT is Lie/ Stand/ Side on the table, Standard is the worst mode and the worst data was included in this report.



**SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Result
§ 15.203	Antenna Requirements	Compliant
§ 15.205	Restricted Bands of Operation	Compliant
§ 15.207	Conducted Emission	N/A
§ 15.231(a)	Deactivate	Compliant
§ 15.209 (a) § 15.231(a)	Radiated Emission	Compliant
§ 15.231(c)	Bandwidth	Compliant

## § 15.209(a) and § 15.231(b) - RADIATED EMISSION

### Standard Applicable

According to §15.209 and 15.5.231, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency Range(MHz)	Limit	
	Quais-Peak(uV)	Quais-Peak (dBuV)
15.209(a)		
30-88	100	40.0
88-216	150	43.5
216-960	200	46.5
960-1000	500	54.0
15.231(b)		
Frequency Range(MHz)	Field Strength of Fundamental	Field Strength of Harmonic
40.66-40.70	2250	225
70-130	1250	125
130-174	1250-3750	125-375
174-260	3750	375
260-470	3750-12500	375-1250
Above 470	12500	1250

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

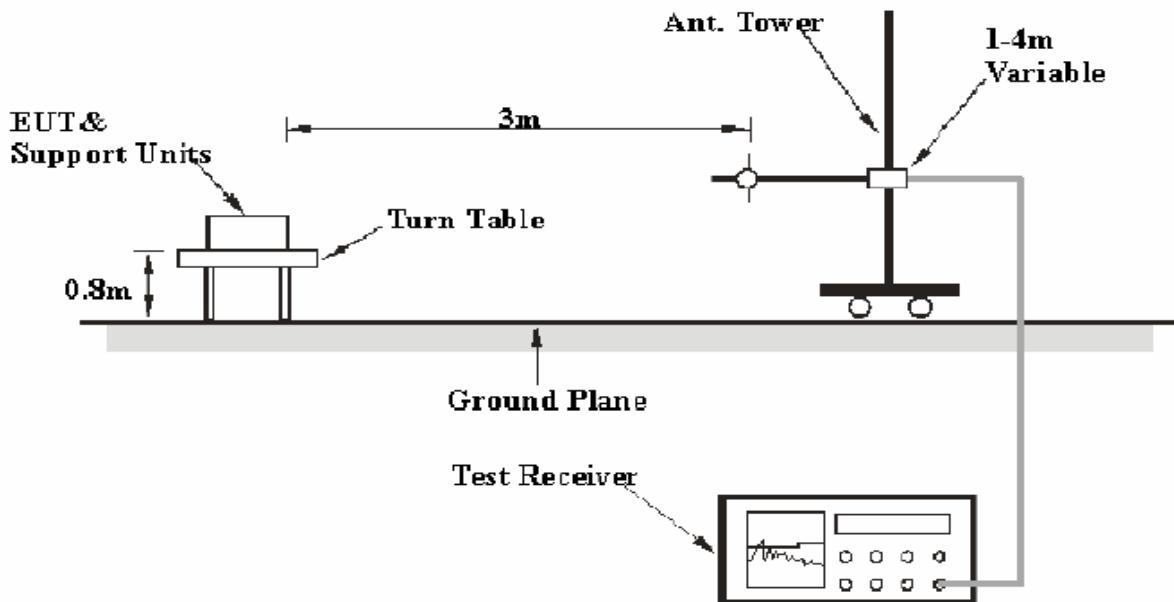
(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

## Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is  $\pm 3.6$  dB.

## EUT Setup



The radiated emission tests were performed in 3-meter standard chamber, using the setup accordance with the ANSI C63.4 - 2003. The specification used was the FCC Part 15 .209(a) and 15.231(b) limits.

The EUT was placed on the center of the test table.

## Test apparatus

Manufacturer	Description	Model	Serial Number	Cal. Date	Cal Due Date
ROHDE & SCHWARZ	ULTRA-BROADBAND ANTENNA	HL562	100015	08/05/2006	08/05/2007
ROHDE & SCHWARZ	EMI TEST RECEIVER	ESI 26	100009	08/05/2006	08/05/2007
ROHDE & SCHWARZ	RF TEST PANEL	TS / RSP	335015/ 0017	N/A	
ETS	TURNTABLE	2088	2149	N/A	
ETS	ANTENNA MAST	2075	2346	N/A	
ROHDE & SCHWARZ	EMI TEST SOFTWARE	ES-K1 V1.71	NA	N/A	
SUNOL SCIENCE	Horn Antenna	DRH-118	A052605	08/05/2006	08/05/2007
SUNOL SCIENCE	Horn Antenna	DRH-118	A052607	08/05/2006	08/05/2007

**\*Statement of Traceability:** BEST attests that all calibrations have been performed per the CNAL /A2LA requirements, traceable to NIM China.

## Test Procedure

For the radiated emissions test, the EUT was place on the center of test table, lie/stand/side to check the max emission, lie is max emission mode. Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the peak detection mode. Quasi-peak readings performed only when an emission was found to be marginal (within -4 dB $\mu$ V of specification limits), and are distinguished with a "Qp" in the data table.

## Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Duty Factor}$$

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB $\mu$ V means the emission is 7dB $\mu$ V below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{FCC Limit} - \text{Corr. Ampl}$$

## Summary of Test Results

The spectrum scan from 30MHz to 5GHz, emission from 30MHz to 1GHz and above 3 th harmonic of fundamental is lower 20 dB than limit, so the test data was omitted.

According to the data in section 4.7, the EUT complied with the FCC Part 15.209(a) and 15.231 standards, and the worst margin of:

**-1.7dB $\mu$ V at 867.84MHz in the Vertical polarization, 3 meters.**

INDICATED			TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC 15.209&231	
Frequency MHz	Meter Reading dB $\mu$ V	Detector		Angle Degree	Height Meter	Polar H/V	Antenna dB $\mu$ V	Cable dB		Corr. Ampl. dB $\mu$ V/m	Limit dB $\mu$ V/m
433.9200	63.14	Peak	183	1.0	H	18.10	2.10	6.94	76.4	100.8	24.4
433.9200	61.94	AV	183	1.0	H	18.10	2.10	6.94	75.2	80.8	5.6
433.9200	66.64	Peak	309	1.0	V	18.10	2.10	6.94	79.9	100.8	20.9
433.9200	65.04	AV	309	1.0	V	18.10	2.10	6.94	78.3	80.8	2.5
867.8400	35.74	Peak	360	1.0	H	22.10	2.80	6.94	53.7	80.8	27.1
867.8400	35.34	AV	360	1.0	H	22.10	2.80	6.94	53.3	60.8	7.5
867.8400	41.94	Peak	360	1.0	V	22.10	2.80	6.94	59.9	80.8	20.9
867.8400	41.14	AV	360	1.0	V	22.10	2.80	6.94	59.1	60.8	1.7
1301.760	23.34	Peak	0	1.0	H	24.80	3.20	6.94	44.4	74.00	29.6
1301.760	22.74	AV	0	1.0	H	24.80	3.20	6.94	43.8	54.00	10.2
1301.760	25.84	Peak	351	1.0	V	24.80	3.20	6.94	46.9	74.00	27.1
1301.760	25.14	AV	351	1.0	V	24.80	3.20	6.94	46.2	54.00	7.8
2169.600	15.64	Peak	186	1.0	H	28.30	3.80	6.94	40.8	80.8	40.0
2169.600	15.24	AV	186	1.0	H	28.30	3.80	6.94	40.4	60.8	20.4
2169.600	17.04	Peak	271	1.0	V	28.30	3.80	6.94	42.2	80.8	38.6
2169.600	16.34	AV	271	1.0	V	28.30	3.80	6.94	41.5	60.8	19.3

## Remark:

1, frequency range investigated from 30MHz to 5GHz All other emission is not detected because the emission is too low.

2, Duty Factor is from FCC ID: K3X WTX001 test report which conducted and issue by TIMCO.

## § 15.231(c) – EMISSION BANDWIDTH

### Standard Applicable

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

### Test Procedure

According to section 13.1.7 of ANSI C63.4-2003, the resolution bandwidth was set to 10 KHz and video bandwidth was set to 30 KHz, all procedure was same as radiation emission section.

### Test apparatus

Manufacturer	Description	Model	Serial Number	Cal. Date	Cal Due Date
R/S	ULTRA-BROADBAND ANTENNA	HL562	100015	08/05/2006	08/05/2007
R/S	EMI TEST RECEIVER	ESI 26	100009	08/05/2006	08/05/2007
R/S	RF TEST PANEL	TS / RSP	335015/ 0017	N/A	
ETS	TURNTABLE	2088	2149	N/A	
ETS	ANTENNA MAST	2075	2346	N/A	
R/S	EMI TEST SOFTWARE	ES-K1 V1.71	NA	N/A	
SUNOL SCIENCE	Horn Antenna	DRH-118	A052605	08/05/2006	08/05/2007
SUNOL SCIENCE	Horn Antenna	DRH-118	A052607	08/05/2006	08/05/2007

### Test data:

Operation Frequency(MHz)	20Db Bandwidth(KHz)	Requirements(KHz)	Result
433.92	62	1084	Pass

