

# **Emissions Test Report**

**EUT Name:** TranspondIT Electric Centron (240V)

EUT Model: MS8EM915CV1

FCC Title 47, Part 15, Subpart C and RSS-210 Section 5

## Prepared for:

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Report/Issue Date: 20 October 2004 Report Number: 30461431.001

Report Number: 30461431.001

EUT: TranspondIT Electric Centron (240V) Model: MS8EM915CV1

33\_EME/I 01/29/2001

## **Statement of Compliance**

Manufacturer: Advanced Technology / Ramar Ltd.

P. O Box 110127

Research Triangle Park 27709

919-991-9924

Requester / Applicant: Scott Seehoffer

Name of Equipment: TranspondIT Electric Centron (240V)

Model No. MS8EM915CV1

Type of Equipment: RF Transmitter

Class of Equipment: Class B

Application of Regulations: FCC Title 47, Part 15, Subpart C and RSS-210 Section 5

Test Dates: 13 August 2004

Guidance Documents:

Emissions: FCC 47 CFR Part 15, RSS-210 Section 5

Test Methods:

Emissions: FCC 47 Part 15, ANSI C63.4:1992

The electromagnetic compatibility test and documented data described in this report has been performed and recorded by TUV Rheinland of North America, in accordance with the standards and procedures listed herein. As the responsible authorized agent of the EMC laboratory, I hereby declare that a sample of one, of the equipment described above, has been shown to be compliant with the EMC requirements of the stated regulations and standards based on these results. If any special accessories and/or modifications were required for compliance, they are listed in the Executive Summary of this report.

This report must not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. This report contains data that are not covered by NVLAP accreditation. This report shall not be reproduced except in full, without the written authorization of the laboratory.

	20 October 2004
NVLAP Signatory	Date

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## 1 Executive Summary

## 1.1 Scope

This report is intended to document the status of conformance with the requirements of the FCC Title 47, Part 15, Subpart C and RSS-210 Section 5 based on the results of testing performed on 13 August 2004 on the TranspondIT Electric Centron (240V) Model No. MS8EM915CV1 manufactured by Advanced Technology / Ramar Ltd.. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

## 1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

## 1.3 Summary of Test Results

Emission	Test Method(s)	Test Parameters	Result
Radiated	47 CFR 15.209 and	9 KHz to 1000 MHz, Class B	compliant
Emissions	15.249, ANSI		
	C63.4:1992		
Conducted	47 CFR 15, ANSI	150 kHz to 30 MHz, Class B	compliant
Emissions	C63.4:1992		
Variation of	47 CFR 15.31e,	Input Voltage varied between 85% to	compliant
Fundamental	ANSI C63.4:1992	115% of nominal input voltage	_
Power with			
Voltage			
Variation			

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Table 1 - Summary of Test Results

## 1.4 Special Accessories

No special accessories were necessary in order to achieve compliance.

## 1.5 Equipment Modifications

No modifications were found to be necessary in order to achieve compliance.

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## 2 Laboratory Information

#### 2.1 Accreditations & Endorsements

#### 2.1.1 US Federal Communications Commission

TUV Rheinland of North America at the 762 Park Ave. Youngsville, N.C 27596 address is accredited by the commission for performing testing services for the general public on a fee basis. This laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (Registration No 90552 and 100881). The laboratory scope of accreditation includes: Title 47 CFR Part 15, 18, and 90. The accreditation is updated every 3 years.

#### 2.1.2 NIST / NVLAP

TUV Rheinland of North America is accredited by the National Voluntary Laboratory Accreditation Program, which is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Guide 17025:1999 and ISO 9002 (Lab code 200094-0). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

## 2.1.3 Japan - VCCI

The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) is a group that consists of Information Technology Equipment (ITE) manufacturers and EMC test laboratories. The purpose of the Council is to take voluntary control measures against electromagnetic interference from Information Technology Equipment, and thereby contribute to the development of a socially beneficial and responsible state of affairs in the realm of Information Technology Equipment in Japan. TUV Rheinland of North America at the 762 Park Ave. Youngsville, N.C 27596 address has been assessed and approved in accordance with the Regulations for Voluntary Control Measures. (Registration No. R-1174, R-1679, C-1790 and C-1791).

## 2.1.4 Acceptance By Mutual Recognition Arrangement

The United States has an established agreement with specific countries under the Asia Pacific Laboratory Accreditation Corporation (APLAC) Mutual Recognition Arrangement. Under this agreement, all TUV Rheinland of North America at the 762 Park Ave. Youngsville, N.C 27596 address test results and test reports within the scope of the laboratory NIST / NVLAP accreditation will be accepted by each member country.

#### 2.2 Test Facilities

All of the test facilities are located at 762 Park Ave., Youngsville, North Carolina 27596, USA.

## 2.2.1 Emission Test Facility

The Open Area Test Site and AC Line Conducted measurement facility used to collect the radiated and conducted data has been constructed in accordance with ANSI C63.7:1992. The site has been measured in accordance with and verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4:1992, at a test distance of 3 and 10 meters. This site has been described in reports dated May 12, 1997, submitted to the FCC, and accepted by letter dated June 25, 1997 (31040/SIT 1300F2). The site is listed with the FCC and accredited by NVLAP (code 200094-0). The 5m semi-anechoic

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chamber used to collect the radiated data has been verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4:1992, at a test distance of 3 meters. A report detailing this site can be obtained from TUV Rheinland of North America.

#### 2.2.2 Immunity Test Facility

ESD, EFT, Surge, PQF: These tests are performed in an environmentally controlled room with a 3.7m x 3.7m x 3.175mm thick aluminum floor connected to PE ground. For ESD testing, tabletop equipment is placed on an insulated mat with a surface resistivity of  $10^9$  Ohms/square on a 1.6m x 0.8m x 0.8m high non-conductive table with a 3.175mm aluminum top (Horizontal Coupling Plane). The HCP is connected to the main ground plane via a low impedance ground strap through two 470 k $\Omega$  resistors. The Vertical Coupling Plane consists of an aluminum plate 50cm x 50cm x 3.175mm thick. The VCP is connected to the main ground plane via a low impedance ground strap through two 470 k $\Omega$  resistors. For each of the other tests, the HCP is removed.

RF Field Immunity testing is performed in a 7.3m x 3.7m x 3.2m anechoic chamber.

RF Conducted and Magnetic Field Immunity testing is performed on a 4.9m x 3.7m x 3.175mm thick aluminum ground plane which is connected to one end of the anechoic chamber.

All test areas allow a minimum distance of 1 meter from the EUT to walls or conducting objects.

## 2.3 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1<sup>st</sup> addition, 1995.

The Combined Standard Uncertainty is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities, equal to the positive square root of a sum of terms, the terms being the variances or co-variances of these other quantities weighted according to how the measurement result varies with changes in these quantities. The term standard uncertainty is the result of a measurement expressed as a standard deviation.

The Expanded Uncertainty defines an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand. The fraction may be viewed as the coverage probability or level of confidence of the interval.

The test system for conducted emissions is defined as the LISN, spectrum analyzer, coaxial cables, and pads. The test system for radiated emissions is defined as the antenna, spectrum analyzer, pre-amplifier, coaxial cables, and pads. The conducted test system has a combined standard uncertainty of  $\pm$  1.2 dB. The radiated test system has a combined standard uncertainty of  $\pm$  1.6 dB. The expanded uncertainty at a level of 95% confidence is obtained by multiplying the combined standard uncertainty by a coverage factor of 2. Compliance criteria are not based on measurement uncertainty.

## 2.4 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Guide 17025:1999.

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# 3 Product Information



Figure 1 – Photo of EUT



Figure 2 – Photo of EUT Installed in Meter



Figure 3 – Photo of EUT Installed in Meter

## 3.1 Product Description

The information for all equipment used in the tested system, including: descriptions of cables, clock and microprocessor frequencies, EMI critical components, and accessory equipment has been supplied by the manufacturer and is listed in the EMC Test Plan found in Section 6.

## 3.2 Equipment Configuration

A description and justification of the equipment configuration is given in the EMC Test Plan. The EUT was tested as described in the EMC Test Plan and was configured and operated in a manner consistent with its intended use. The EUT was connected to rated power and allowed to warm up to normal operating conditions. The placement of the EUT system components was guided by the test standard and selected to represent typical installation conditions.

In the case of an EUT that can operate in more than one configuration, preliminary testing was performed to determine the configuration that produced maximum radiation.

The final configuration was selected to produce worse case radiation and place the EUT in the most susceptible state. There were no deviations from the description of the Equipment Configuration given in the EMC Test Plan.

#### 3.3 Operation Mode

A description and justification of the operation mode is given in the EMC Test Plan.

In the case of an EUT that can operate in more than one state, preliminary testing was performed to determine the operating mode that produced maximum radiation.

The final operating mode was selected to produce worse case radiation and place the EUT in the most susceptible state. There were no deviations from the description of the Operation Mode given in the EMC Test Plan.

## 4 Emissions

#### 4.1 Radiated Emissions

Testing was performed in accordance with 47 CFR 15.209 and 15.249, ANSI C63.4:1992. These test methods are listed under the laboratory's NVLAP Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices.

#### 4.1.1 Test Methodology

## 4.1.1.1 Preliminary Test

A test program that controls instrumentation and data logging was used to automate the preliminary RF emission test procedure. The frequency range of interest was divided into sub-ranges to yield a frequency resolution of approximately 300 kHz and provide a reading at each frequency for no more than 12° of turntable rotation. For each frequency sub-range the turntable was rotated 360° while peak emission data was recorded and plotted over the frequency range of interest in horizontal and vertical antenna polarization's.

Preliminary emission profile testing was performed inside the anechoic chamber. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm above the floor. The EUT was positioned as shown in the setup photographs. The receiving antenna was placed at a distance of 3m at a fixed height of 1m. Measurement equipment was located outside of the chamber. A video camera was placed inside the chamber to view the EUT.

#### 4.1.1.2 Final Test

For each frequency measured, the peak emission was maximized by manipulating the receiving antenna from 1 to 4 meters above the ground plane and placing it at the position that produced the maximum signal strength reading. The turntable was then rotated through 360° while observing the peak signal and placing the EUT at the position that produced maximum radiation. The six highest emissions relative to the limit were measured unless such emissions were more than 20 dB below the limit. If less than six emissions are within 20 dB of the limit, than the noise level of the receiver is measured at frequencies where emissions are expected. Multiples of all oscillator and microprocessor frequencies were also checked.

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Final testing was performed on an NSA compliant test site. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane. The placement of EUT and cables were the same as for preliminary testing and is shown in the setup photographs.

#### 4.1.1.3 Deviations

There were no deviations from this test methodology.

## 4.1.2 Test Results

Section 4.1.2.1 lists the final measurement data under the worst case operating modes, configurations, and/or cable positions. It also reflects the results including any modifications and/or special accessories listed in Sections 1.4 and 1.5.

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

#### 4.1.2.1 Final Data

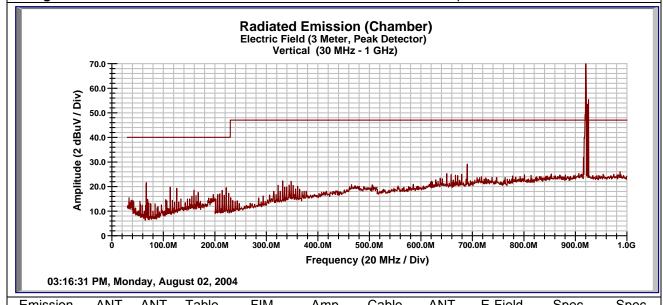
The data recorded in this section contains the final results under the worst-case conditions and with any modifications or special accessories implemented as the manufacturer intends.

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JUP I Raula	ated Emis	ssions			Trac	cking # 3	30461431.0	001 Page 1	of 7
EUT Name EUT Model EUT Serial Standard Dist/Ant Used Configuration	Transpor MS8EM9 None FCC 47 (	dIT Electric 15CV1 CFR Part 15 DB, SAS-51		Section 5	Da Te Te Li Rl	ate emp / Hu emp / Hu ine AC / I BW / VB\ erformed	m in 75 m out N/A Freq. 240 W 120	August 2004 Deg. F / 50% A 0 VAC / 60 H 0 KHz / 300 gene Moses	% RH Hz KHz
			Radiated Electric Fiel	Emission ld (3 Meter, Pontal (30 MHz	(Chambe	er)			
Amplitude (2 dBuV / Div)	0.0					La Control de la			
		.om 200.0M August 02, 200	300.0M		00.0M 600. (20 MHz / Div		DM 800.0M	900.0M	1.0G
03:14:34 P Emission	ὑ 100 M, Monday, A ANT AN	August 02, 200 T Table	FIM	Frequency	(20 MHz / Div	ANT	E-Field	Spec	Spec
03:14:34 P Emission	ó 100 M, Monday, A ————————————————————————————————————	August 02, 200 T Table s Pos	FIM Value	Amp Gain	Cable Loss	ANT Factor	E-Field Value	Spec Limit	Spec Margin
03:14:34 P  Emission Freq F (MHz) (	o 100 M, Monday, A ANT AN Polar Po (H/V) (m	August 02, 200 T Table s Pos ) (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec
Emission Freq F (MHz) (Measurements	M, Monday, A  ANT AN  Polar Po  (H/V) (m)  made with	T Table s Pos ) (deg) I sas-516 lo	FIM Value (dBuV) g periodic,	Amp Gain (dB) RBW=120	Cable Loss (dB) KHz, VBW	ANT Factor (dB/m) V 300 KH	E-Field Value (dBuV/m) z. 3m from	Spec Limit (dBuV/m)	Spec Margin (dB)
Emission Freq F (MHz) (Measurements 919.80	M, Monday, A  ANT AN  Polar Po  (H/V) (m)  made with  H 2	T Table s Pos ) (deg) sas-516 lo 26 3 q-p	FIM Value (dBuV) g periodic,	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin
03:14:34 P  Emission Freq F (MHz) ( Measurements 919.80   Dipole EMCO 3	ANT AN Polar Po (H/V) (m) made with H 2	T Table s Pos (deg) sas-516 lo 26 3 q-p	FIM Value (dBuV) g periodic, 64.14	Amp Gain (dB) RBW=120	Cable Loss (dB) KHz, VBW	ANT Factor (dB/m) V 300 KH: 23.40	E-Field Value (dBuV/m) z. 3m from 90.01	Spec Limit (dBuV/m) n eut. 94.00	Spec Margin (dB)
Emission Freq F (MHz) (Measurements 919.80 Dipole EMCO 3 919.90	M, Monday, A  ANT AN  Polar Po  (H/V) (m)  made with  H 2  3121C-DB4	T Table s Pos (deg) sas-516 lo 26 3 q-p	FIM Value (dBuV) g periodic, 64.14	Amp Gain (dB) RBW=120	Cable Loss (dB) KHz, VBW	ANT Factor (dB/m) V 300 KH	E-Field Value (dBuV/m) z. 3m from	Spec Limit (dBuV/m) n eut. 94.00	Spec Margin (dB)
Emission Freq F (MHz) (Measurements 919.80 Dipole EMCO 3 919.90 Measurements	M, Monday, A  ANT AN  Polar Po  (H/V) (m)  made with  H 2  3121C-DB4  H 1  made with	T Table s Pos ) (deg) sas-516 lo 26 3 q-p 1 11 q-p sas-516 lo sas-516 lo	FIM Value (dBuV) g periodic, 64.14  59.88 g periodic.	Amp Gain (dB) RBW=120 0.00	Cable Loss (dB) KHz, VBW 2.47	ANT Factor (dB/m) V 300 KH: 23.40	E-Field Value (dBuV/m) z. 3m from 90.01	Spec Limit (dBuV/m) n eut. 94.00	Spec Margin (dB) -3.99
Emission Freq F (MHz) (Measurements 919.80 Dipole EMCO 3 919.90 Measurements 222.30	M, Monday, A  ANT AN  Polar Po  (H/V) (m)  made with  H 2  3121C-DB4  H 1  made with  H 1	T Table s Pos ) (deg) 1 sas-516 lo 26 3 q-p 4 11 q-p 1 sas-516 lo 44 268	FIM Value (dBuV) g periodic, 64.14  59.88 g periodic. 14.47	Amp Gain (dB) RBW=120 0.00 0.00	Cable Loss (dB) KHz, VBW	ANT Factor (dB/m) V 300 KH: 23.40	E-Field Value (dBuV/m) z. 3m from 90.01	Spec Limit (dBuV/m) n eut. 94.00	Spec Margin (dB) -3.99
Emission Freq F (MHz) (MHz) (MHz) (Measurements 919.80 Dipole EMCO 3919.90 Measurements 222.30 Measurements	M, Monday, A  ANT AN  Polar Po  (H/V) (m)  made with  H 2  3121C-DB4  H 1  made with  H 1	T Table s Pos ) (deg) sas-516 lo 26 3 q-p 4 11 q-p sas-516 lo 244 268 unit on sid	FIM Value (dBuV) g periodic, 64.14  59.88 g periodic. 14.47 e. Using dip	Amp Gain (dB) RBW=120 0.00 0.00 0.00	Cable Loss (dB) KHz, VBW 2.47  1.17	ANT Factor (dB/m) V 300 KH: 23.40 29.18	E-Field Value (dBuV/m) z. 3m from 90.01 91.53	Spec Limit (dBuV/m) n eut. 94.00 94.00	Spec Margin (dB) -3.99 -2.47
Emission Freq F(MHz) (Measurements 919.80 Dipole EMCO 3 919.90 Measurements 222.30 Measurements 919.90	M, Monday, A  ANT AN  Polar Po  (H/V) (m)  made with  H 2  3121C-DB4  H 1  made with  H 1  made with  H 1	T Table s Pos (deg) sas-516 lo 26 3 q-p 4 11 q-p sas-516 lo 44 268 unit on sid 198	FIM Value (dBuV) g periodic, 64.14  59.88 g periodic. 14.47 e. Using dip 50.88	Amp Gain (dB) RBW=120 0.00 0.00 0.00 0.00 0.00	Cable Loss (dB) KHz, VBW 2.47	ANT Factor (dB/m) V 300 KH: 23.40	E-Field Value (dBuV/m) z. 3m from 90.01	Spec Limit (dBuV/m) n eut. 94.00 94.00	Spec Margin (dB) -3.99
Emission Freq F (MHz) (Measurements 919.80 Dipole EMCO 3 919.90 Measurements 222.30 Measurements 919.90 Measurements 919.90 Measurements	M, Monday, A  ANT AN  Polar Po  (H/V) (m)  made with  H 2  3121C-DB4  H 1  made with  H 1  made with  H 1  made with	Table S Pos (deg) Sas-516 lo 26 3 q-p 1 11 q-p 1 sas-516 lo 44 268 1 unit on sid 198 1 unit on bac	FIM Value (dBuV) g periodic, 64.14  59.88 g periodic. 14.47 e. Using dip 50.88 ck. With dip	Amp Gain (dB) RBW=120 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Cable Loss (dB) KHz, VBW 2.47  1.17	ANT Factor (dB/m) V 300 KH: 23.40 29.18 11.50 29.18	E-Field Value (dBuV/m) z. 3m from 90.01 91.53 27.14	Spec Limit (dBuV/m) eut. 94.00 94.00 40.00	Spec Margin (dB) -3.99 -2.47 -12.86
Emission Freq F(MHz) (Measurements 919.80 Dipole EMCO 3 919.90 Measurements 222.30 Measurements 919.90	M, Monday, A  ANT AN  Polar Po  (H/V) (m)  made with  H 2  3121C-DB4  H 1  made with  H 1  made with  H 1  made with	T Table s Pos (deg) sas-516 lo 26 3 q-p 4 11 q-p sas-516 lo 44 268 unit on sid 198	FIM Value (dBuV) g periodic, 64.14  59.88 g periodic. 14.47 e. Using dip 50.88 ck. With dip	Amp Gain (dB) RBW=120 0.00 0.00 0.00 0.00 0.00	Cable Loss (dB) KHz, VBW 2.47  1.17	ANT Factor (dB/m) V 300 KH: 23.40 29.18	E-Field Value (dBuV/m) z. 3m from 90.01 91.53	Spec Limit (dBuV/m) eut. 94.00 94.00 40.00	Spec Margin (dB) -3.99 -2.47
Emission Freq F (MHz) (Measurements 919.80 Dipole EMCO 3 919.90 Measurements 222.30 Measurements 919.90 Measurements 919.90 Measurements	M, Monday, A  ANT AN  Polar Po  (H/V) (m)  made with  H 2  3121C-DB4  H 1  made with  H 1	Table s Pos (deg) sas-516 lo 26 3 q-p 4 11 q-p sas-516 lo 44 268 unit on sid 178q-p 178q-p	FIM Value (dBuV) g periodic, 64.14  59.88 g periodic. 14.47 e. Using dip 50.88 ck. With dip 59.21	Amp Gain (dB) RBW=120 0.00 0.00 0.00 0.00 0le 0.00	Cable Loss (dB) KHz, VBW 2.47  1.17  2.47	ANT Factor (dB/m) V 300 KH: 23.40 29.18 29.18 29.18	E-Field Value (dBuV/m) z. 3m from 90.01 91.53 27.14 82.53	Spec Limit (dBuV/m) n eut. 94.00 40.00 40.00 94.00	Spec Margin (dB) -3.99 -2.47 -12.86 -11.47 -3.14

SOP 1 Radia	ted Emissions	Tracking # 304614	31.001 Page 2 of 7
<b>EUT Name</b>	TranspondIT Electric Centron (240V)	Date	2 August 2004
<b>EUT Model</b>	MS8EM915CV1	Temp / Hum in	75 Deg. F / 50% RH
<b>EUT Serial</b>	None	Temp / Hum out	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Section 5	Line AC / Freq.	240 VAC / 60 Hz
		RBW / VBW	120 KHz / 300 KHz
Dist/Ant Used	3M / 3110B, SAS-516	Performed by	Eugene Moses
Configuration	04001018 Transmitter. All measurements made	with Quasi-peak det	ector.



Emission	AN'	T ANT	Table	FIM	Amp	Cable	ANT	E-Field	Spec	Spec
Freq	Pola	ar Pos	Pos	Value	Gain	Loss	Factor	Value	Limit	Margin
(MHz)	(H/\	/) (m)	(deg)	(dBuV)	(dB)	(dB)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)
Measuremen	its ma	ade with sa	as-516 log	g periodic, F	RBW=120	KHz, VBW	/ 300 KH	z. 3m from	eut.	
919.90	V	1.1	133	61.48	0.00	2.47	21.90	85.85	94.00	-8.15
Dipole EMCO	312	3C-DB4								
919.90	٧	2.38 q-p	58	52.90	0.00	2.47	29.18	84.55	94.00	-9.45
Measuremen	ts ma	ade with sa	as-516 log	g periodic.						
67.11	V	1	0	1.76	0.00	0.62	8.60	10.98	40.00	-29.02
Measuremen	its ma	ade with ur	nit on side	e. With dipo	le					
919.90	V	1.14	18	61.43	0.00	2.47	29.18	93.08	94.00	-0.92
Measuremen	ts ma	ade with ur	nit on bac	k. With dipo	ole.					
919.90	V	1q-p	49.76	49.76	0.00	2.47	29.18	81.41	94.00	-12.59
Spec Margin =	E-Fie	eld Value - I	_imit, E-F	ield Value =	FIM Value	- Amp Gain	+ Cable L	oss + ANT F	actor ± Unc	ertainty
Combined Stand	dard U	ncertainty U <sub>c</sub>	$\pm 1.60$	dB Expande	ed Uncertaint	$U = ku_c(y)$	/) $k = 2$	for 95% confid	dence	

EUT Model MS	ranspondI7 IS8EM9150 Ione CC 47 CFF M / 3115-5 4001018 T	R Part 15 770 ransmitte Ra	diated Emir Electric Field Horizon	Section 5  Ssion Prodi (3-Meter, Patral (1 GHz to	D To Li R Po	ate emp / Hui emp / Hui ine AC / F BW / VBV erformed	m in 2 / 75 m out N// Freq. 240 W 1 N	August 2004 Deg. F / 509 A 0 VAC / 60 H MHz / 3 MHz gene Moses	Hz
EUT Model EUT Serial Standard  Dist/Ant Used Configuration  No.0  10.0	M / 3115-5 4001018 T	R Part 15 770 ransmitte Ra	diated Emiselectric Field Horizon	Section 5  Ssion Prodi (3-Meter, Patral (1 GHz to	ofile (Charreak Detectors of 10 GHz)	emp / Hui emp / Hui ine AC / F BW / VBV erformed nber)	m in 75 m out N// Freq. 24 W 1 N I by Eu	Deg. F / 50% A 0 VAC / 60 H MHz / 3 MHz gene Moses	Hz
EUT Model EUT Serial Standard  Dist/Ant Used Configuration  No.0  10.0	M / 3115-5 4001018 T	R Part 15 770 ransmitte Ra	diated Emiselectric Field Horizon	Section 5  Ssion Prodi (3-Meter, Patral (1 GHz to	ofile (Charreak Detectors of 10 GHz)	emp / Hui emp / Hui ine AC / F BW / VBV erformed nber)	m in 75 m out N// Freq. 24 W 1 N I by Eu	Deg. F / 50% A 0 VAC / 60 H MHz / 3 MHz gene Moses	Hz
EUT Serial Standard  Dist/Ant Used Configuration  No.  10.0	M / 3115-5 4001018 T	R Part 15 770 ransmitte Ra	diated Emir Electric Field Horizon	ssion Prod (3-Meter, Phtal (1 GHz to	ofile (Charreak Detectors of 10 GHz)	emp / Hui ine AC / F BW / VBV erformed nber)	m out N// Freq. 244 W 1 N I by Eu	A 0 VAC / 60 HMHz / 3 MHz gene Moses	Hz
Standard FC  Dist/Ant Used 3N  Configuration 04  80.0 T  70.0 T  (Angle of the configuration	M / 3115-5 4001018 T	770 ransmitte Ra	diated Emir Electric Field Horizon	ssion Prod (3-Meter, Phtal (1 GHz to	Dfile (Charreak Detector of 10 GHz)	nber)	Freq. 240 W 1 N I by Eu	O VAC / 60 H MHz / 3 MHz gene Moses	
Dist/Ant Used 3N Configuration 04  80.0 7 70.0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	M / 3115-5 4001018 T	770 ransmitte Ra	diated Emir Electric Field Horizon	ssion Prod (3-Meter, Phtal (1 GHz to	ofile (Chan leak Detector to 10 GHz)	nber)	W 1 N	MHz / 3 MHz gene Moses	
Configuration 04  80.0  70.0  70.0  (Angp) 50.0  901  40.0  10.0  10.0  10.0  10.0  Configuration 04	4001018 T	Ra 3.00	diated Emir Electric Field Horizon	5.0G	ofile (Chaneak Detector of 10 GHz)	nber)	I by Eu	gene Moses	
Configuration 04  80.0  70.0  70.0  (Angp) 50.0  901  40.0  10.0  10.0  10.0  10.0  Configuration 04	4001018 T	Ra 3.00	diated Emir Electric Field Horizon	5.0G	ofile (Char eak Detector o 10 GHz)	nber)			
80.0 7 70.0 1 (Angle 10.0 1 20.0 1 10.0 1 09:03:40 AM, T	G 2.0G	Ra	diated Emir Electric Field Horizon	5.0G	eak Detector o 10 GHz)		8.0G	9.0G	10.0G
Emission AN		,,							
(MHz) (H/V	ar Pos	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
Peak Value	• , (,	(409)	(abar)	(42)	(42)	(42/111)	(45477111)	(aba viii)	(42)
1840.00 H	1.76	95	49.01	35.41	4.99	27.78	46.38	74.00	-27.62
Average Value			l l		I	ll.	I		
1840.00 H	1.76	95	32.70	35.41	4.99	27.78	30.07	54.00	-23.93
0				EINAN ( )	<u> </u>	. 0.11			
Spec Margin = E-Fie									ertainty
Combined Standard Ur Notes:	Incertainty $u_c$	( <i>y)</i> = ± 1.60	dB Expande	d Uncertaint	y U = ku₅(∫	/) K = 21	for 95% conf	ridence	

SOP 1 Radia	ated E	Emissio	ns			Trac	cking# 3	304614	31.0	01 Page 4	of 7
FUT Name	<b>T</b>	IIT I	⊏la atala	0 t (0	40) ()	_	-4-		O A		
EUT Name				Centron (24	40V)		ate			ugust 2004	/ DII
EUT Model		EM915C	V1				emp / Hu			Deg. F / 50%	% KH
EUT Serial	None		Dark 4.5	DOC 040 (	2		emp / Hu		N/A		I_
Standard	FCC	47 CFR	Part 15,	RSS-210 S	Section 5		ine AC / I	•		VAC / 60 F	1Z
	014	0445 555					BW / VB			Hz / 3 MHz	
Dist/Ant Used						P	erformed	by	Eug	ene Moses	
Configuration	0400	1018 Tra	ansmittei	<u> </u>							
			Rad	diated Emi Electric Field Vertica	ssion Pro d (3-Meter, Po al (1 GHz to	eak Detector	mber)				
80	<sup>0</sup> ₹∏										
70	.o <del>.</del>										
S	. ‡										
Amplitude (dBuV)	.0 <u></u>										
<b>□</b> 50	.o <del>‡</del>								-		
# pn 40	.,‡					Barra Barrara	A A STATE OF THE PARTY OF THE P	ويبطار أشحم	ودواري ويدا		
plit 40	<u> </u>		and the same of th	- Andrew Control	كالمفتين والمستان						
A 30	.o <u>†</u> v.	And the Parket	btek								
20	الٍـــــ										
20	<u> </u>										
10	.0 <del>     </del> 1.0G	2.0G	3.0G	4.0G	5.0G	6.0G	7.0G	8.00	+	9.0G	10.0G
	1.0G	2.00	3.00	4.0G			7.00	0.00	,	9.00	10.0G
						ncy (MHz)					
I III					Freque	ncy (MHz)					
09:20:00 A	M, Tues	day, Augu	st 03, 200	4	Freque	ncy (MHz)					
	M, Tues	sday, Augu ANT	st 03, 2004 Table	4 FIM		ncy (MHz) Cable	ANT	E-Fie	eld	Spec	Spec
Emission		•	·		Amp Gain	, ,	ANT Factor	E-Fie Valu		Spec Limit	Spec Margin
Emission A	ANT	ANT	Table	FIM	Amp	Cable			ie		
Emission A	ANT Polar	ANT Pos	Table Pos	FIM Value	Amp Gain	Cable Loss	Factor	Valu	ie	Limit	Margin
Emission Freq F	ANT Polar	ANT Pos	Table Pos	FIM Value	Amp Gain	Cable Loss	Factor	Valu (dBuV	ie	Limit	Margin
Emission A Freq F (MHz) ( Peak Value	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	Factor (dB/m)	Valu (dBuV	ie //m)	Limit (dBuV/m)	Margin (dB)
Emission Freq F (MHz) (Peak Value 1840.00	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	Factor (dB/m)	Valu (dBuV	ie //m)	Limit (dBuV/m)	Margin (dB)
Emission A Freq F (MHz) ( Peak Value 1840.00 Average value	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	Factor (dB/m) 27.86	Valu (dBuV	ie //m) 7.58	Limit (dBuV/m)	Margin (dB) -26.42
Emission A Freq F (MHz) ( Peak Value 1840.00 Average value	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	Factor (dB/m) 27.86	Valu (dBuV	ie //m) 7.58	Limit (dBuV/m)	Margin (dB) -26.42
Emission A Freq F (MHz) ( Peak Value 1840.00 Average value	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	Factor (dB/m) 27.86	Valu (dBuV	ie //m) 7.58	Limit (dBuV/m)	Margin (dB) -26.42
Emission A Freq F (MHz) ( Peak Value 1840.00 Average value	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	Factor (dB/m) 27.86	Valu (dBuV	ie //m) 7.58	Limit (dBuV/m)	Margin (dB) -26.42
Emission A Freq F (MHz) ( Peak Value 1840.00 Average value	ANT Polar (H/V)	ANT Pos (m) 1.41 1.41	Table Pos (deg)	FIM Value (dBuV)  50.14  33.50  ield Value =	Amp Gain (dB) 35.41 35.41	Cable Loss (dB) 4.99 4.99	Factor (dB/m)  27.86  27.86  + Cable L	Valu (dBuV 47	7.58 0.94	Limit (dBuV/m) 74.00	Margin (dB) -26.42 -23.06
Emission / Freq F (MHz) (Peak Value 1840.00 Average value 1840.00	ANT Polar (H/V)  V  V  -Field	ANT Pos (m) 1.41 1.41	Table Pos (deg)  68  68  mit, E-Fi	FIM Value (dBuV)  50.14  33.50  ield Value =	Amp Gain (dB) 35.41 35.41	Cable Loss (dB) 4.99	Factor (dB/m)  27.86  27.86  + Cable L	Valu (dBuV 47	ie //m) 7.58 0.94	Limit (dBuV/m)  74.00  54.00  Factor ± Unc	Margin (dB) -26.42 -23.06
Emission A Freq F (MHz) (Peak Value 1840.00 Average value 1840.00	ANT Polar (H/V)  V  V  -Field	ANT Pos (m) 1.41 1.41	Table Pos (deg)  68  68  mit, E-Fi	FIM Value (dBuV)  50.14  33.50  ield Value =	Amp Gain (dB) 35.41 35.41	Cable Loss (dB) 4.99 4.99	Factor (dB/m)  27.86  27.86  + Cable L	Valu (dBuV 47 30 .oss + A	ie //m) 7.58 0.94	Limit (dBuV/m)  74.00  54.00  Factor ± Unc	Margin (dB) -26.42 -23.06
Emission Freq (MHz) (Peak Value 1840.00 Average value 1840.00  Spec Margin = E Combined Standar	ANT Polar (H/V)  V  V  -Field	ANT Pos (m) 1.41 1.41	Table Pos (deg)  68  68  mit, E-Fi	FIM Value (dBuV)  50.14  33.50  ield Value =	Amp Gain (dB) 35.41 35.41	Cable Loss (dB) 4.99 4.99	Factor (dB/m)  27.86  27.86  + Cable L	Valu (dBuV 47 30 .oss + A	ie //m) 7.58 0.94	Limit (dBuV/m)  74.00  54.00  Factor ± Unc	Margin (dB) -26.42 -23.06
Emission Freq (MHz) (Peak Value 1840.00 Average value 1840.00  Spec Margin = E Combined Standar	ANT Polar (H/V)  V  V  -Field V	ANT Pos (m) 1.41 1.41	Table Pos (deg)  68  68  mit, E-Fi	FIM Value (dBuV)  50.14  33.50  ield Value =	Amp Gain (dB) 35.41 35.41	Cable Loss (dB) 4.99 4.99	Factor (dB/m)  27.86  27.86  + Cable L	Valu (dBuV 47 30 .oss + A	ie //m) 7.58 0.94	Limit (dBuV/m)  74.00  54.00  Factor ± Unc	Margin (dB) -26.42 -23.06
Emission Freq (MHz) (Peak Value 1840.00 Average value 1840.00  Spec Margin = E Combined Standar	ANT Polar (H/V)  V  V  -Field V	ANT Pos (m) 1.41 1.41	Table Pos (deg)  68  68  mit, E-Fi	FIM Value (dBuV)  50.14  33.50  ield Value =	Amp Gain (dB) 35.41 35.41	Cable Loss (dB) 4.99 4.99	Factor (dB/m)  27.86  27.86  + Cable L	Valu (dBuV 47 30 .oss + A	ie //m) 7.58 0.94	Limit (dBuV/m)  74.00  54.00  Factor ± Unc	Margin (dB) -26.42 -23.06
Emission Freq (MHz) (Peak Value 1840.00 Average value 1840.00  Spec Margin = E Combined Standar	ANT Polar (H/V)  V  V  -Field V	ANT Pos (m) 1.41 1.41	Table Pos (deg)  68  68  mit, E-Fi	FIM Value (dBuV)  50.14  33.50  ield Value =	Amp Gain (dB) 35.41 35.41	Cable Loss (dB) 4.99 4.99	Factor (dB/m)  27.86  27.86  + Cable L	Valu (dBuV 47 30 .oss + A	ie //m) 7.58 0.94	Limit (dBuV/m)  74.00  54.00  Factor ± Unc	Margin (dB) -26.42 -23.06
Emission Freq (MHz) (Peak Value 1840.00 Average value 1840.00  Spec Margin = E Combined Standar	ANT Polar (H/V)  V  V  -Field V	ANT Pos (m) 1.41 1.41	Table Pos (deg)  68  68  mit, E-Fi	FIM Value (dBuV)  50.14  33.50  ield Value =	Amp Gain (dB) 35.41 35.41	Cable Loss (dB) 4.99 4.99	Factor (dB/m)  27.86  27.86  + Cable L	Valu (dBuV 47 30 .oss + A	ie //m) 7.58 0.94	Limit (dBuV/m)  74.00  54.00  Factor ± Unc	Margin (dB) -26.42 -23.06
Emission Freq (MHz) (Peak Value 1840.00 Average value 1840.00  Spec Margin = E Combined Standar	ANT Polar (H/V)  V  V  -Field V	ANT Pos (m) 1.41 1.41	Table Pos (deg)  68  68  mit, E-Fi	FIM Value (dBuV)  50.14  33.50  ield Value =	Amp Gain (dB) 35.41 35.41	Cable Loss (dB) 4.99 4.99	Factor (dB/m)  27.86  27.86  + Cable L	Valu (dBuV 47 30 .oss + A	ie //m) 7.58 0.94	Limit (dBuV/m)  74.00  54.00  Factor ± Unc	Margin (dB) -26.42 -23.06
Emission Freq (MHz) (Peak Value 1840.00 Average value 1840.00  Spec Margin = E Combined Standar	ANT Polar (H/V)  V  V  -Field V	ANT Pos (m) 1.41 1.41	Table Pos (deg)  68  68  mit, E-Fi	FIM Value (dBuV)  50.14  33.50  ield Value =	Amp Gain (dB) 35.41 35.41	Cable Loss (dB) 4.99 4.99	Factor (dB/m)  27.86  27.86  + Cable L	Valu (dBuV 47 30 .oss + A	ie //m) 7.58 0.94	Limit (dBuV/m)  74.00  54.00  Factor ± Unc	Margin (dB) -26.42 -23.06

SOP 1 Radia	ated E	missi	ons			T	racking #	304614	31.0	001 Page 5	of 7
EUT Name				Centron (2	240V)		Date			ugust 2004	
EUT Model		EM915	CV1				Temp / Hu			Deg. F / 50%	% RH
EUT Serial	None						Temp / Hu				
Standard	FCC 4	47 CFF	R Part 15	, RSS-210	Section 5		Line AC /	Freq.	240	VAC / 60 H	lz
							<b>RBW/VB</b>	W	9 K	Hz / 30 KHz	•
Dist/Ant Used	3M / 6	3511					Performed	d by	Eug	gene Moses	
Configuration	04001	1018 T	ransmitte	r							
130.0 <del></del>			Ra	9kHz to	ission Pro 10kHz (Peak ical (9kHz to 1	Detector)	amber)				
l											
120.0											
S 110.0											
á											
≥ 100.0											=
₩ 90.0											
8											
9 80.0											
Amplitude (2 dBuV / Div)											
. ≌ +											
\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \											
A 60.0											
50.0 50.0											
50.0											
` <del> </del>											10.0K
50.0	M, Friday,	, Augus	: 13, 2004		Frequency	(MHz)					10.0K
50.0 40.0 1.0K 04:56:30 PI		, Augus ANT	: 13, 2004 Table	FIM	Frequency	(MHz)	ANT	E-Fie	eld	Spec	10.0K
50.0 40.0 1.0K 04:56:30 PI				FIM Value			ANT	E-Fie Valu		Spec Limit	
50.0 40.0 1.0K 04:56:30 PI Emission Freq	ANT	ANT	Table		Amp	Cable			ue		Spec
50.0 40.0 1.0K 04:56:30 PI Emission Freq	ANT Polar	ANT Pos	Table Pos	Value	Amp Gain	Cable Loss	Factor	Valu	ue	Limit	Spec Margin
50.0 40.0 1.0K 04:56:30 PF Emission Freq	ANT Polar	ANT Pos	Table Pos	Value	Amp Gain	Cable Loss	Factor	Valu	ue	Limit	Spec Margin
50.0 40.0 1.0K 04:56:30 PF Emission Freq	ANT Polar	ANT Pos	Table Pos	Value	Amp Gain	Cable Loss	Factor	Valu	ue	Limit	Spec Margin
40.0 40.0 1.0K 04:56:30 PF Emission Freq	ANT Polar	ANT Pos	Table Pos	Value	Amp Gain	Cable Loss	Factor	Valu	ue	Limit	Spec Margin
50.0 40.0 1.0K 04:56:30 PF Emission Freq	ANT Polar	ANT Pos	Table Pos	Value	Amp Gain	Cable Loss	Factor	Valu	ue	Limit	Spec Margin
40.0 40.0 1.0K 04:56:30 PF Emission Freq	ANT Polar	ANT Pos	Table Pos	Value	Amp Gain	Cable Loss	Factor	Valu	ue	Limit	Spec Margin
50.0 40.0 1.0K 04:56:30 PI Emission Freq	ANT Polar	ANT Pos	Table Pos	Value	Amp Gain	Cable Loss	Factor	Valu	ue	Limit	Spec Margin
50.0 40.0 1.0K 04:56:30 PI Emission Freq	ANT Polar	ANT Pos	Table Pos	Value	Amp Gain	Cable Loss	Factor	Valu	ue	Limit	Spec Margin
50.0 40.0 1.0K 04:56:30 PI Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	Factor (dB/m)	Valu (dBu\	ue //m)	Limit (dBuV/m)	Spec Margin (dB)
Emission Freq (MHz)  Spec Margin = E	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	Factor (dB/m)	Valu (dBuV	ue //m)	Limit (dBuV/m)	Spec Margin (dB)
Emission Freq (MHz)  Spec Margin = E Combined Standa	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	Factor (dB/m)	Valu (dBu\	ue //m)	Limit (dBuV/m)	Spec Margin (dB)
Emission Freq (MHz)  Spec Margin = E	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	Factor (dB/m)	Valu (dBuV	ue //m)	Limit (dBuV/m)	Spec Margin (dB)
Emission Freq (MHz)  Spec Margin = E Combined Standa	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	Factor (dB/m)	Valu (dBuV	ue //m)	Limit (dBuV/m)	Spec Margin (dB)
Emission Freq (MHz)  Spec Margin = E Combined Standa	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	Factor (dB/m)	Valu (dBuV	ue //m)	Limit (dBuV/m)	Spec Margin (dB)
Emission Freq (MHz)  Spec Margin = E Combined Standa	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	Factor (dB/m)	Valu (dBuV	ue //m)	Limit (dBuV/m)	Spec Margin (dB)
Emission Freq (MHz)  Spec Margin = E Combined Standa	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	Factor (dB/m)	Valu (dBuV	ue //m)	Limit (dBuV/m)	Spec Margin (dB)
Emission Freq (MHz)  Spec Margin = E Combined Standa	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	Factor (dB/m)	Valu (dBuV	ue //m)	Limit (dBuV/m)	Spec Margin (dB)
Emission Freq (MHz)  Spec Margin = E Combined Standa	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	Factor (dB/m)	Valu (dBuV	ue //m)	Limit (dBuV/m)	Spec Margin (dB)
Emission Freq (MHz)  Spec Margin = E Combined Standa	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	Factor (dB/m)	Valu (dBuV	ue //m)	Limit (dBuV/m)	Spec Margin (dB)

SOP 1 Radia	ated En	nissi	ons			Tra	cking#	30461431.0	001 Page 6	of 7	
EUT Name	Transp	ondl	Γ Electric	Centron (2	40V)	D	ate	2 A	ugust 2004		
EUT Model	MS8EN			<u> </u>	,		emp / Hu		75 Deg. F / 50% RH		
EUT Serial	None						Temp / Hum out N/A				
Standard		7 CFF	R Part 15.	RSS-210	Section 5		ine AC /		VAC / 60 F	lz	
Deg/sweep	12						BW / VB		Hz / 30 KHz		
Dist/Ant Used		502					erformed		gene Moses		
Configuration			ransmitte	r		-	0110111100	iby Lu	90110 1110000	'	
130.0			Rad	diated Em Electric Fiel Vertic	ission Pro d (3-Meter, P al (10kHz to	eak Detecto	mber) <sup>or)</sup>				
Table 100 Pm 100					Marine Marine						
40.0 40.0 20.0 10.0 1.0K 04:43:18 PI	И, Monday	, Augu	st 02, 2004	10.0K	Frequency	· (MHz)	100.0K	•		1.0M	
		ANT	Table	FIM	Amp	Cable	ANT	E-Field	Spec	Spec	
•		Pos (m)	Pos (deg)	Value (dBuV)	Gain (dB)	Loss (dB)	Factor (dB/m)	Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)	
Dana Manain 5	- F:-I-I V-		:it	:-1-1 \	FINA Value	A O	Oabla I	ANIT	Factor I IIIa		
Spec Margin = E Combined Standa Notes:								for 95% conf		ertairity	

ooi inadic	ated Emissi	ons			Tr	acking#	3046143°	.001 Page 7	of 7
EUT Name	Transpondl		Centron (2	40\/\	ı	Date	2	August 2004	
	MS8EM915		Cention (2	<del>1</del> 0 <i>V)</i>					)/ DII
EUT Model		CVT		Temp / Hum in 75 Deg. F / 50% RH					
EUT Serial	None		500.040	Temp / Hum out N/A					
Standard	FCC 47 CF	, RSS-210	Line AC /		40 VAC / 60 F				
						RBW / VB	<b>W</b> 9	KHz / 30 KHz	<u> </u>
Dist/Ant Used	3M / 6502					Performed	by E	ugene Moses	}
Configuration	04001018 T	ransmitte	r				_		
Emission Freq F (MHz) (	I, Monday, Augu ANT ANT Polar Pos H/V) (m)	Race of the second seco	FIM Value (dBuV)	Frequency Amp Gain (dB)	cak Detect 30 MHz)  (MHz)  Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/n	Limit n) (dBuV/m)  T Factor ± Unc	Spec Margin (dB)

## **4.1.3** Photos



Figure 4 - Radiated Emissions Test Setup (Chamber - Front)



Figure 5 - Radiated Emissions Test Setup (Chamber - Back)

## **4.1.4** Sample Calculation

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength  $(dB\mu V/m) = FIM - AMP + CBL + ACF$ 

Where:  $FIM = Field Intensity Meter (dB\mu V)$ 

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

 $dB\mu V / m$ 

 $\mu V/m = 10^{-20}$ 

## 4.2 Conducted Emissions

Testing was performed in accordance with 47 CFR 15, ANSI C63.4:1992. These test methods are listed under the laboratory's NVLAP Scope of Accreditation.

Report Number: 30461431.001

EUT: TranspondIT Electric Centron (240V) Model: MS8EM915CV1

33\_EME/I 01/29/2001

This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices.

## **4.2.1** Test Methodology

A test program that controls instrumentation and data logging was used to automate the AC Power Line Conducted emission test procedure. The frequency range of interest was divided into sub-ranges such as to yield a frequency resolution of 9 kHz. For each frequency sub-range, each phase and neutral of the AC power line were measured with respect to ground. Measurements were performed using a set of  $50\mu H/50\Omega$  LISNs.

Testing is either performed in the anechoic chamber or on PLC Site 2. The setup photographs clearly identify which site was used. The vertical ground plane used in the anechoic chamber is a 2m x 2m wooden frame that is covered with ¼ inch hardware cloth and is bonded to the horizontal ground plane.

In the case of tabletop equipment, the EUT is placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane and 40cm from a vertical ground reference plane. The rear of the EUT was positioned flush with the backside of the table and directly over the LISNs. The power and I/O cables were routed over the edge of the table and bundled approximately 40cm from the ground plane. Support equipment was powered from a separate LISN. Floor-standing equipment is placed directly on the ground plane.

#### 4.2.1.1 Deviations

There were no deviations from this test methodology.

#### 4.2.2 Test Results

Section 4.2.2.1 lists the final measurement data under the worst case operating modes, configurations, and/or cable positions. It also reflects the results including any modifications and/or special accessories listed in Sections 1.4 and 1.5.

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Plots of the EUT's AC Line Conducted emissions are contained in the following sections. The plots show peak and/or average emissions and the corresponding peak and/or average limits. If the peak emissions are below the average limit, then the EUT is considered to pass and no average measurements are made. If the peak emissions are below the quasi-peak limit and the average emissions are below the average limit, then the EUT is considered to pass and no further measurements are made. Otherwise, individual frequencies are measured and compared to the corresponding limit for the detector used (quasi-peak or average).

#### 4.2.2.1 Final Data

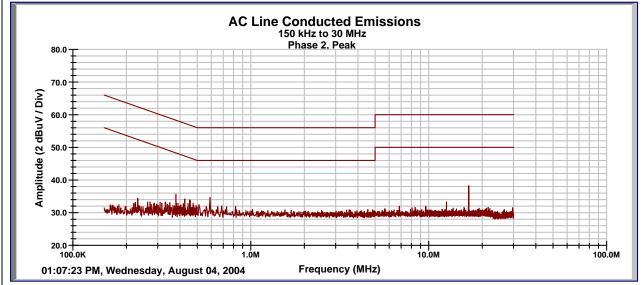
The data recorded in this section contains the final results under the worst-case conditions and with any modifications or special accessories implemented as the manufacturer intends.

Report Number: 30461431.001 EUT: TranspondIT Electric Centron (240V) Model: MS8EM915CV1

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SOP 2 Con	ducted E	Emissions	}		-	Tracking #	304614	31.001 Page	1 of 2
EUT Name EUT Model EUT Serial	Transpo	ondIT Electi 915CV1		n (240V)		Date Tempera Humidit		4 August 200 75 Deg. F 50% RH	)4
Standard LISNs Used		CFR Part	15, RSS-2	10 Section	Line AC Perform	/ Freq	240 VAC / 60 Hz Eugene Moses		
Configuration									
			AC Lir	ne Condu 150 kHz to Phase 1		sions			
80.0				Filase	i, reak				
70.0									
Amplitude (2 dBuV / Div)									
7) 50.0 ap									
	100 100 100								
30.0	Hurstufffatt			dan dalah da	ico de proceso de abbilida		Jales Lagrana		
20.0 <del> </del> 100.0K 01:04:35		sday, August	+ + + +   1.0M 04, 2004	Frequ	uency (MHz)	10.0M	· ·	1 1 1 1	100.0M
Emission Freq	Line ID	FIM Quasi	FIM Ave	Cable Loss	LISN + T Limiter	Quasi Limit	Ave Limit	Quasi Spec Margin	Ave Spec Margin
(MHz) 16.78	(1,2,3,N) 1	(dBuV) 24.91	(dBuV) 15.66	(dB) 0.15	(dB) 10.49	(dBuV) 60.00	(dBuV) 50.00	(dB) -24.45	(dB) -23.70
Quasi Spec Marg	in = Quasi F	IM + Cable I	oss + LISN C	F - Quasi Li	mit + Uncert	aintv			
Ave Spec Margin Combined Standa	= Ave FIM -	Cable Loss	+ LISN CF - A	Ave Limit ±			or 95% conf	idence	
Notes:									
İ									

SOP 2 Cond	ducted Emissions	Tracking # 30461431.001 Page 2 of 2				
EUT Name	TranspondIT Electric Centron (240V)	Date	4 August 2004			
EUT Model	MS8EM915CV1	Temperature	75 Deg. F			
<b>EUT Serial</b>	None	Humidity	50% RH			
Standard	FCC 47 CFR Part 15, RSS-210 Section 5	Line AC / Freq	240 VAC / 60 Hz			
LISNs Used	7, 8	Performed by	Eugene Moses			
Configuration Original						
AC Line Conducted Emissions  150 kHz to 30 MHz Phase 2. Peak						



Emission	Line	FIM	FIM	Cable	LISN +	Quasi	Ave	Quasi Spec	Ave Spec
Freq	ID	Quasi	Ave	Loss	T Limiter	Limit	Limit	Margin	Margin
(MHz)	(1,2,3,N)	(dBuV)	(dBuV)	(dB)	(dB)	(dBuV)	(dBuV)	(dB)	(dB)
16.78	2	24.54	14.73	0.15	10.61	60.00	50.00	-24.70	-24.51
								·	
								·	

Quasi Spec Margin = Quasi FIM + Cable Loss + LISN CF - Quasi Limit  $\pm$  Uncertainty Ave Spec Margin = Ave FIM + Cable Loss + LISN CF - Ave Limit  $\pm$  Uncertainty

Combined Standard Uncertainty  $u_c(y) = \pm 1.2$ dB Expanded Uncertainty  $U = ku_c(y)$  k = 2 for 95% confidence

Notes:

## **4.2.3** Photos

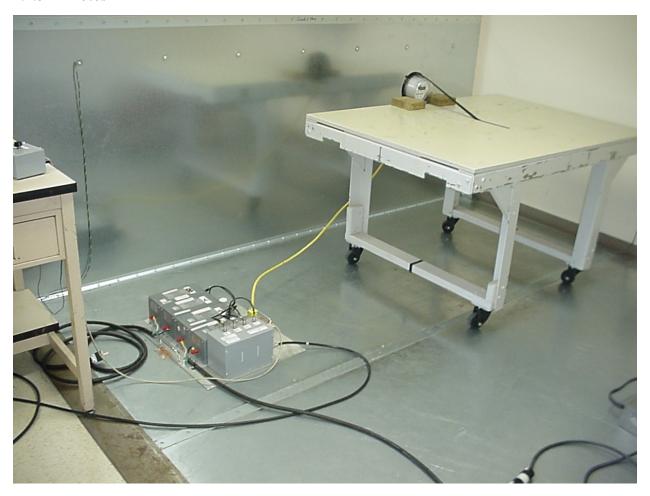


Figure 6 - Conducted Emissions Test Setup (Front)

## 4.2.4 Sample Calculation

The signal strength is calculated by adding the LISN Correction Factor and Cable Loss to the measured reading. The basic equation is as follows:

Field Strength  $(dB\mu V/m) = FIM + CBL + LCF$ 

Where:  $FIM = Field Intensity Meter (dB\mu V)$ 

CBL = Cable Loss (dB) LCF = LISN Loss (dB)

 $\frac{dB\mu V/m}{2}$ 

 $\mu V/m = 10^{-20}$ 

## 4.3 Variation of Fundamental Power with Voltage Variation (CFR 47, Part 15.31e)

Testing was performed in accordance with 47 CFR 15.209 and 15.249, ANSI C63.4:1992. These test methods are listed under the laboratory's NVLAP Scope of Accreditation. Test Methodology.

This test measures the variation in RF power output when the applied input voltage is varied between 85% and 115% of nominal voltage.

#### 4.3.1.1 Final Test

For each frequency measured, the peak emission was maximized by manipulating the receiving antenna from 1 to 4 meters above the ground plane and placing it at the position that produced the maximum signal strength reading. The turntable was then rotated through 360° while observing the peak signal and placing the EUT at the position that produced maximum radiation.

Final testing was performed on an NSA compliant test site. The EUT was placed on a 1.0m x 1.5m nonconductive table 80cm above the ground plane.

#### 4.3.1.2 Deviations

There were no deviations from this test methodology.

#### 4.3.2 Test Results

Section 4.1.2.1 lists the final measurement data under the worst case operating modes, configurations, and/or cable positions. It also reflects the results including any modifications and/or special accessories listed in Sections 1.4 and 1.5.

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

#### 4.3.2.1 Final Data

The data recorded in this section contains the final results under the worst-case conditions and with any modifications or special accessories implemented as the manufacturer intends.

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Radiated I	Radiated Emissions Tracking # 30461431.001 Page 1 of 1										
EUT Name	Tran	spondl <sup>-</sup>	T Electric	Centron (2	40V)		Date	;	2 Aı	ugust 2004	
<b>EUT Model</b>	MS8EM915CV1						<b>Temp / Hum in</b> 75 Deg. F / 50% RH			6 RH	
<b>EUT Serial</b>	None				Temp / Hum out N/A						
Standard	FCC 47 CFR Part 15, RSS-210 Section 5					Line AC / Freq 204,240,276 / 60 Hz					
Dist/Ant Us							Performed			ene Moses	
Configurati		01018	Transmitte	er. Unit on s	side. All m	easuren	nents are Q	uasi-Pe	ak.	RBW = 120	KHz
VBW = 300					_						_
Emission	ANT	ANT	Table	FIM	Amp	Cable		E-Fiel		Spec	Spec
Freq (MHz)	Polar	Pos	Pos	Value	Gain	Loss	Factor	Value		Limit	Margin
Measureme	(H/V)	(m)	(deg)	(dBuV)	(dB)	(dB)	(dB/m)	(dBuV/	111)	(dBuV/m)	(dB)
919.90	H	1	198	50.88	0.00	2.4	7 29.18	82.	53	94.00	-11.47
Measureme							23.10	02.	55	3 <del>1</del> .00	-11.71
919.90	Н	1	10	49.67	0.00	2.4	7 29.18	81.	32	94.00	-12.68
Measureme		•						0	<u></u>	0 1.00	12.00
919.90	Н	1	10	48.35	0.00	2.4	7 29.18	80.	00	94.00	-14.00
Measureme	nts mad	e with ເ	unit on sid	le. With dip	ole. 240 V	AC					
919.90	V	1.14	18	61.43	0.00	2.4	7 29.18	93.	80	94.00	-0.92
Measureme											
919.90		1.13	18	62.01	0.00	2.4	7 29.18	93.	66	94.00	-0.34
Measureme								1		1	
919.90	V	1.14	18	61.90	0.00	2.4	7 29.18	93.	55	94.00	-0.45
Spec Margin	= E-Field	Value -	Limit, E-l	ield Value =	FIM Value	- Amp G	Sain + Cable	Loss + A	NT	Factor ± Und	certainty
Combined Star					led Uncertair	_		2 for 95%			
Notes: The			•	diated power	er is on the	side. T	his was pre	viously ı	mea	sured in the	Э
radiated em	ission se	ection, a	above.								

## **4.3.3** Photos



Figure 7 - Radiated Emissions Test Setup (Chamber - Front)



Figure 8 - Radiated Emissions Test Setup (Chamber - Back)

# 5 Test Equipment Use List

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal dd/mm/yy	Next Cal dd/mm/yy
SOP 1 - Radiated Emi	ssions (5 Meter Char	mber)			
Amplifier, preamp	Agilent Technologies	8449B	3008A01480	10-May-04	10-May-05
Ant. Biconical	EMCO	3110B	3367	4-Feb-04	4-Feb-05
Ant. Log Periodic	AH Systems	SAS-516	133	19-Jan-04	19-Jan-05
Antenna Horn	EMCO	3115	5770	14-Oct-03	14-Oct-04
Cable, Coax	Andrew	FSJ1-50A	003	15-Jan-04	15-Jan-05
Cable, Coax	Andrew	FSJ1-50A	042	15-Jan-04	15-Jan-05
Cable, Coax	Andrew	FSJ1-50A	045	15-Jan-04	15-Jan-05
Chamber, Semi-Anechoic	Braden Shielding	5 meter	A67631	27-Jan-04	27-Jan-05
Data Table, EMCWin	TUV Rheinland	EMCWin.dll	002	6-Jan-02	6-Jan-06
Spectrum Analyzer	Agilent Tec.	E7405A	US39440157	11-Aug-03	11-Aug-04

SOP 2 - Conducted Emissions (AC/DC and Signal I/O)							
Cable, Coax	Belden	RG-213	004	19-Jan-04	19-Jan-05		
LISN (5) 50mH/50Ω	Solar Electronics	8028-50-TS-24	990441	6-Aug-03	6-Aug-04		
LISN (6) 50mH/50Ω	Solar Electronics	8028-50-TS-24	990442	6-Aug-03	6-Aug-04		
LISN Selection Box	TUV Rheinland	CFL-9206	1650	11-May-04	11-May-05		
Spectrum Analyzer	Agilent Tec.	E7405A	US39440161	11-Aug-03	11-Aug-04		
Variation of Fundamental Power with Voltage Variation (CFR 47, Part 15.31e) (5 Meter Chamber)							
Amplifier, preamp	Agilent Technologies	8449B	3008A01480	10-May-04	10-May-05		
Ant. Biconical	EMCO	3110B	3367	4-Feb-04	4-Feb-05		
Ant. Log Periodic	AH Systems	SAS-516	133	19-Jan-04	19-Jan-05		
Antenna Horn	EMCO	3115	5770	14-Oct-03	14-Oct-04		
Cable, Coax	Andrew	FSJ1-50A	003	15-Jan-04	15-Jan-05		
Cable, Coax	Andrew	FSJ1-50A	042	15-Jan-04	15-Jan-05		
Cable, Coax	Andrew	FSJ1-50A	045	15-Jan-04	15-Jan-05		
Chamber, Semi-Anechoic	Braden Shielding	5 meter	A67631	27-Jan-04	27-Jan-05		
Data Table, EMCWin	TUV Rheinland	EMCWin.dll	002	6-Jan-02	6-Jan-06		
Spectrum Analyzer	Agilent Tec.	E7405A	US39440157	11-Aug-03	11-Aug-04		

General Laboratory Equipment						
Ant. Dipole Set BL 1-4	EMCO	3121C	9302-914	20-Oct-03	20-Oct-04	
Filter, 1.5 GHz High Pass	Bonn Elektronik	BHF 1500	025155	07/22/03	07/22/04	
Meter, Multi	Fluke	79-3	69200606	6-Aug-03	6-Aug-04	
Meter, Temp/Humid/Barom	Fisher	02-400	01	13-Aug-03	13-Aug-04	
Power Supply, AC	California Instruments	1251P	L06429	CNR II	CNR II	

<sup>\*</sup> Calibration of equipment past due for re-calibration will be performed expeditiously. If any equipment is found to be out of tolerance at that time, affected customers will be notified accordingly.

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## **EMC Test Plan**

A test plan was not provided by the manufacturer for this testing. EUT operation and configuration was based on the applicable test standards and actual application of the EUT.

#### 1. OUTLINE FCC TEST PLAN

The test set up is shown in Fig 1 Use test procedures as defined by ANSI C63.4-1992

#### 1.1. Equipment Under Test (EUT)

TransPondIT Serial Number	Meter Serial Number	Capacitor Value (C1)
04001018	324090695	330nF

## All units are to be tested in Form 2S meters (as supplied).

For FCC testing all 4 links (see figure 2 below) need to be fitted. Units have been dispatched with these links fitted.

Note: The normal pulse repetition rate of 0.2Hz is below the minimum rate of 20Hz permitted by the FCC for use with quasi peak detectors. Therefore, the maximum transmitted field strength will be measured by setting the unit to a 20.833Hz PRF and using quasi-peak detector.

#### 1.2. Radiated Emissions

Limits as set in section 15.249:

Fundamental (field strength) = 50mV/m @ 3m = 93.98dBuV (based on quasipeak detector).

Therefore the FCC limit of the fundamental is: 93.98dBuV-Antenna factor (dB/m)-Cable loss (dB).....Equation 1

Harmonics (field strength) = 500uV/m @ 3m (based on average detector) -Convert to  $dBuV = 20Log_{10}(500) = 53.98$ 

FCC limit = 53.98 dBuV - Antenna factor (dB/m) - cable loss (dB) (based on peak **detector**)......Equation 2

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#### Measurement detector functions:

The field strength of fundamental frequency will be measured using a quasipeak detector function.

The field strength of the harmonics will be measured using a peak detector function.

Note: Emissions radiated outside the band (902MHz to 928MHz), except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or 200uV/m @ 3m, which ever is the lesser attenuation.

- 1. 1. Ensure ALL links are fitted as shown in figure 2: this sets the EUT to transmit an RF packet (128 bits) that modulates the RF carrier. PRF is 20.833Hz.
- 2. Setup the measurement equipment with the following settings:

Centre frequency = 919.8976MHz

RBW = 120KHz: VBW = 300KHz

- 1. 3. Set the antenna for horizontal polarization. Using a **peak** detector adjust the antennas height so as to determine the maximum field strength. Note the antennas height and maximum field strength.
- 2. 4. Repeat step 2 and determine the maximum field strength with the antenna vertically polarized. Note the antennas height and maximum field strength.
- 3. 5. From the results of 2 & 3, set the antenna height that gave the maximum field strength.
- 4. 6. Set up the measurement equipment to perform a *quasi-peak* measurement.
- 5. 7. Determine the maximum field strength.
- 6. 8. Use equation 1 to determine the EUT maximum radiated emission of the fundamental (919.8976MHz).

#### **Harmonics**

Setup the measurement equipment to record using an average detector function.

- 1. 9. Ensure ALL links are fitted as shown in figure 2 in the EUT. This sets the EUT to transmit RF packets at a 20.833 Hz PRF
- 2. 10. Set the antenna height to that obtained in step 5.
- 3. 11. Using both vertical and horizontal polarization measure the 2 to 10 harmonic field strengths.
- 4. 12. Use equation 2 to determine the maximum field strengths of the harmonics.
- 5. 13. Generate test reports.

#### 1.3. Conducted Emissions

Refer to section 15.207: Conducted limit is 250uV (based on quasi-peak detector)

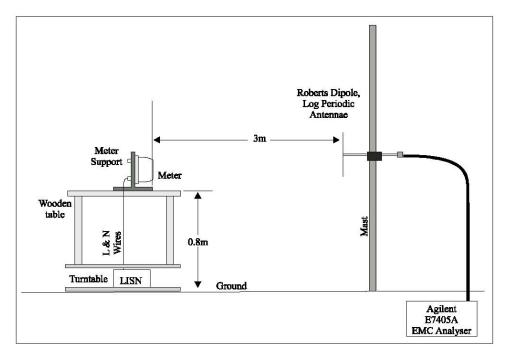
Measure the conducted emissions amplitudes between 150kHz to 30MHz on the live and neutral sides of the ac power lines of the EUT. Compliance shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

#### Method of measurement

- 1) Set detection mode to peak detection with 10kHz bandwidth
- 2) Scan the receiver from 150kHz to 30MHz
- 3) Record the peak emission amplitude for each frequency
- 4) Set detection mode to CISPR quasi-peak detection with 9kHz bandwidth.
- 5) Record the quasi-peak amplitude value for each frequency with a PEAK margin of less than 10dB
- 6) Set detection mode to Average detection with a 10kHz bandwidth
- 7) Record Average amplitude values for each frequency with a CISPR margin of less than 6dB
- 8) Generate test report.

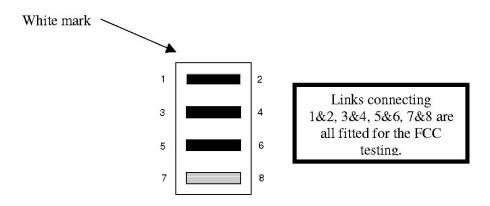
#### This completes the FCC testing strategy.

Fig 1: The Test set up



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Figure 2: FCC Link Settings – rear view of PCB



Note: Normal operation has links 1&2, 3&4, 7&8 fitted only.