FCC PART 15, SUBPART B and C
TEST REPORT

for

WIRELESS INTERFACE UNIT

MODEL: ADWI

Prepared for

FEDERAL SIGNAL CORPORATION
2645 FEDERAL SIGNAL DRIVE
UNIVERSITY PARK, ILLINOIS 60466-3195

Prepared by:_____

KYLE FUJIMOTO

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DATE: SEPTEMBER 4, 2003

	REPORT BODY	APPENDICES					TOTAL
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GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Compatible Electronics Inc., 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: Wireless Interface Unit
Model: ADWI
S/N: N/A

Product Description: See Expository Statement.

Modifications: The EUT was not modified during the testing.

Manufacturer: Federal Signal Corporation
2645 Federal Signal Drive
University Park, Illinois 60466-3195

Test Date: August 21, 2003

Test Specifications: EMI requirements
CFR Title 47, Part 15 Subpart B; and Subpart C, Sections 15.205, 15.207, 15.209, and 15.249

Test Procedure: ANSI C63.4: 2001

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	Complies with the Class B limits of CFR Title 47, Part 15, Subpart B; and Subpart C, section 15.207.
2	Radiated RF Emissions, 10 kHz - 9300 MHz	Complies with the Class B limits of CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.209, and 15.249.

1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the Wireless Interface Unit Model: ADWI. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4: 2001. 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; and Subpart C, sections 15.205, 15.207, 15.209, and 15.249.

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 92823.

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

Federal Signal Corporation

Pat Morasan	Engineer
Stephen Niemczak	Director of Engineering

Compatible Electronics, Inc.

Kyle Fujimoto	Test Engineer
Michael Christensen	Test Engineer

2.4 Date Test Sample was Received

The test sample was received on August 20, 2003.

2.5 Disposition of the Test Sample

The sample was returned to Federal Signal Corporation on September 2, 2003.

2.6 Abbreviations and Acronyms

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

RF	Radio Frequency
EMI	Electromagnetic Interference
EUT	Equipment Under Test
P/N	Part Number
S/N	Serial Number
HP	Hewlett Packard
ITE	Information Technology Equipment
CML	Corrected Meter Limit
LISN	Line Impedance Stabilization Network

3. APPLICABLE DOCUMENTS

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

SPEC	TITLE
CFR Title 47, Part 15	FCC Rules – Radio frequency devices (including digital devices)
ANSI C63.4 2001	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

Setup and operation of the equipment under test.

Specifics of the EUT and Peripherals Tested

The Wireless Interface Unit Model: ADWI (EUT) was connected to a function generator. The EUT was continuously transmitting and receiving. The antenna is connected to the EUT by a reverse polarity SMA connector. The connector is attached to a bracket that is directed connected directly to the PCB. The connector is also tightened by a nut that prevents easy removal of the connector.

Note: When the EUT was receiving the signal from the function generator, the EUT was in transmit mode. When the function generator was turned off, the EUT was in receive mode.

The final radiated as well as conducted data was taken in the mode above. Please see Appendix E for the data sheets.

4.1.1 Cable Construction and Termination

Cable 1 This is a 2.5 meter shielded cable connecting the EUT to the function generator. It had a BNC connector at the function generator end and was hard wired into the EUT. The cable was bundled to a length of 1 meter. The shield of the cable was grounded to the chassis at the function generator end only.

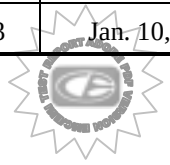
5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

5.1 EUT and Accessory List

EQUIPMENT	MANUFACTURER	MODEL NUMBER	SERIALNUMBER	FCC ID
WIRELESS INTERFACE UNIT (EUT)	FEDERAL SIGNAL CORPORATION	ADWI	N/A	**HVVADWI**
FUNCTION GENERATOR	BK PRECISION	3011	2483	**N/A**

5.2 EMI Test Equipment

EQUIPMENT TYPE	MANU-FACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
Radiated Emissions Data Capture Program	Compatible Electronics	2.0	N/A	N/A	N/A
Conducted Emissions Test Program	Compatible Electronics	N/A	N/A	N/A	N/A
Spectrum Analyzer – Main Section	Hewlett Packard	8566B	2727A04757	November 12, 2002	Nov. 11, 2003
Spectrum Analyzer – Display Section	Hewlett Packard	85662A	2648A15455	November 12, 2002	Nov. 11, 2003
Spectrum Analyzer – Quasi-Peak Adapter	Hewlett Packard	85650A	3303A01688	November 12, 2002	Nov. 11, 2003
RF Attenuator	Weinschel Corp.	2	BJ6396	August 7, 2003	Aug. 7, 2004
LISN	Com Power	LI-215	12078	November 20, 2002	Nov. 20, 2003
LISN	Com Power	LI-215	12082	November 20, 2002	Nov. 20, 2003
EMI Receiver	Rohde & Schawrz	ESIB40	100172	July 22, 2003	July 22, 2004
Preamplifier	Com Power	PA-102	1017	January 2, 2003	Jan. 2, 2004
Biconical Antenna	Com Power	AB-100	1548	September 19, 2002	Sept. 19, 2003
Log Periodic Antenna	Com Power	AL-100	16089	October 4, 2002	Oct. 4, 2003
Antenna Mast	Com Power	AM-100	N/A	N/A	N/A
Turntable	Com Power	TT-100	N/A	N/A	N/A
Computer	Hewlett Packard	4530	US91912319	N/A	N/A
Monitor	Hewlett Packard	D5258A	TW74500641	N/A	N/A
Loop Antenna	Com-Power	AL-130	17070	June 19, 2002	June 19, 2004
Horn Antenna	Antenna Research	DRG-118/A	1053	January 13, 2002	Jan. 13, 2004
Microwave Preamplifier	Com-Power	PA-122	25196	January 10, 2003	Jan. 10, 2004



6. TEST SITE DESCRIPTION

6.1 Test Facility Description

Please refer to section 2.1 and 7.1 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.

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 Conducted Emissions Test

The spectrum analyzer was used as a measuring meter. The data was collected with the spectrum analyzer in the peak detect mode with the "Max Hold" feature activated. The quasi-peak was used only where indicated in the data sheets. A 10 dB attenuation pad was used for the protection of the spectrum analyzer input stage, and the offset was adjusted accordingly to read the actual data measured. The LISN output was measured using the spectrum analyzer. 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: 2001. 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 complies with the **Class B** limits of **CFR** Title 47, Part 15, Subpart B; and the limits of CFR Title 47, Part 15, Subpart C, Section 15.207 for conducted emissions.

7.2 Radiated Emissions (Spurious and Harmonics) Test

The spectrum analyzer and EMI Receiver were used as a measuring meter along with the quasi-peak adapter. Amplifiers were used to increase the sensitivity of the instrument. The Com Power Preamplifier Model: PA-102 was used for frequencies from 30 MHz to 1 GHz, and the Com-Power Microwave Preamplifier Model: PA-122 was used for frequencies above 1 GHz. The spectrum analyzer and EMI Receiver were used in the peak detect mode with the "Max Hold" feature activated. In this mode, the spectrum analyzer records the highest measured reading over all the sweeps.

The measurement bandwidths and transducers used for the radiated emissions test were:

FREQUENCY RANGE	EFFECTIVE MEASUREMENT BANDWIDTH	TRANSDUCER
9 kHz to 150 kHz	200 Hz	Active Loop Antenna
150 kHz to 30 MHz	9 kHz	Active Loop Antenna
30 MHz to 300 MHz	120 kHz	Biconical Antenna
300 MHz to 1 GHz	120 kHz	Log Periodic Antenna
1 GHz to 9.30 GHz	1 MHz	Horn Antenna

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: 2001. 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 in order 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 (con't)

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 test distance to obtain final test data. The final qualification data sheets are located in Appendix E.

8. CONCLUSIONS

The Wireless Interface Unit Model: ADWI meets all of the Class B specification limits defined in CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.207, 15.209, and 15.249.

APPENDIX A

LABORATORY RECOGNITIONS

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

Radio-Frequency Technologies (Competent Body)

APPENDIX B

MODIFICATIONS TO THE EUT

MODIFICATIONS TO THE EUT

The modifications listed below were made to the EUT to pass FCC 15.207, 15.249 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

ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST

Wireless Interface Unit
Model: ADWI
S/N: N/A

There were no additional models covered under this report.

APPENDIX D

DIAGRAMS, CHARTS, AND PHOTOS

FIGURE 1: CONDUCTED EMISSIONS TEST SETUP

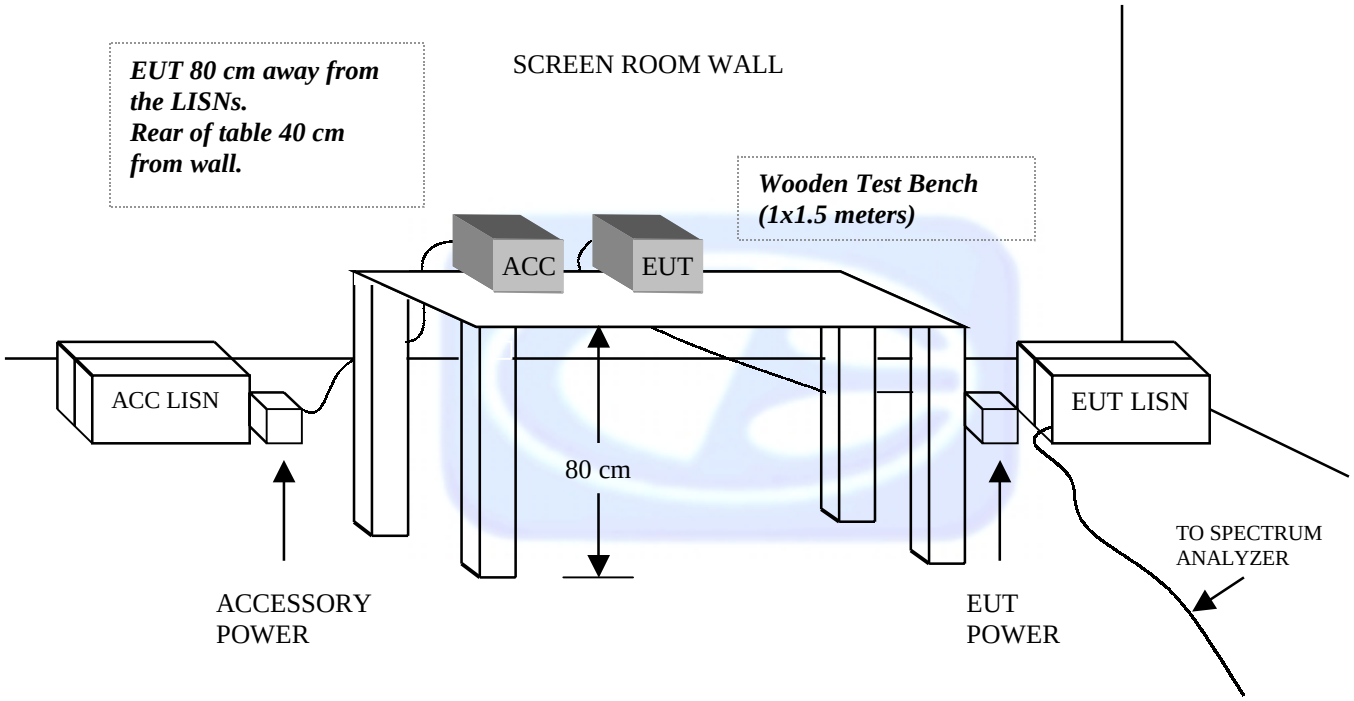
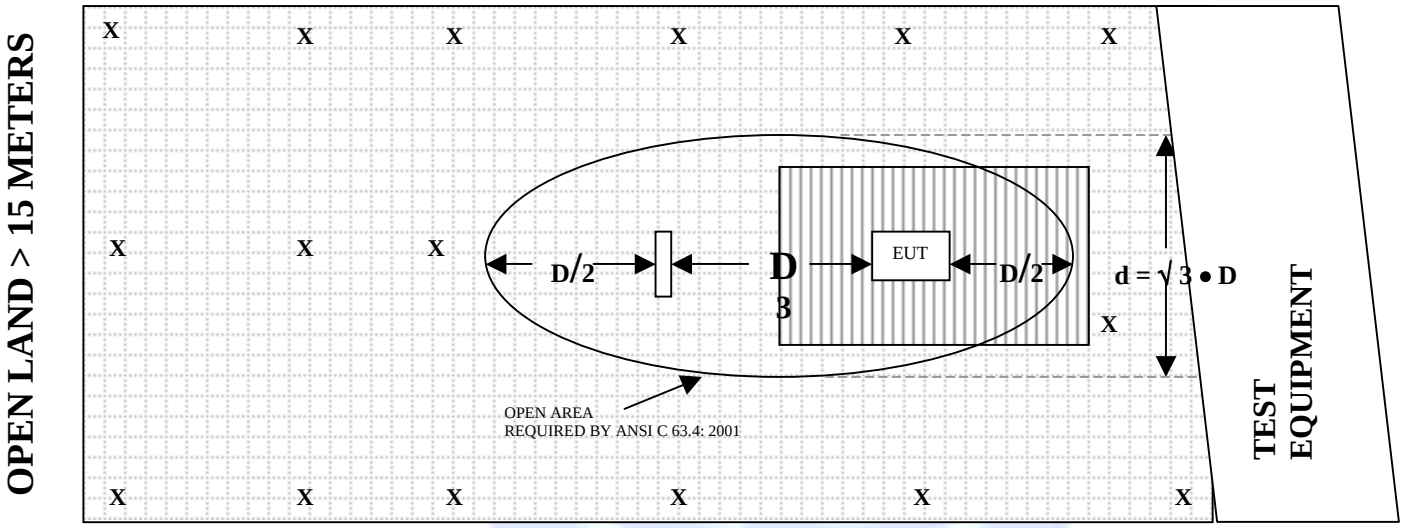


FIGURE 2: PLOT MAP AND LAYOUT OF RADIATED SITE

OPEN LAND > 15 METERS



OPEN LAND > 15 METERS

X = GROUND RODS	= GROUND SCREEN
D = TEST DISTANCE (meters)	= WOOD COVER

COM-POWER AB-100

BICONICAL ANTENNA

S/N: 01548

CALIBRATION DATE: SEPTEMBER 19, 2002

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	14.30	120	10.70
35	14.00	125	11.40
40	13.70	140	12.70
45	12.00	150	12.50
50	11.40	160	12.90
60	9.70	175	14.10
70	8.30	180	14.70
80	7.60	200	15.10
90	7.80	250	16.90
100	8.60	300	19.10

COM-POWER AL-100

LOG PERIODIC ANTENNA

S/N: 16089

CALIBRATION DATE: OCTOBER 4, 2002

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
300	13.10	700	17.70
350	14.40	750	19.60
400	14.30	800	20.50
450	15.70	850	21.20
500	16.60	900	21.20
550	16.60	950	22.50
600	17.30	1000	24.60
650	18.80		

COM-POWER PA-102

PREAMPLIFIER

S/N: 1017

CALIBRATION DATE: JANUARY 2, 2003

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	38.4	300	38.3
40	38.4	350	38.3
50	38.3	400	38.3
60	38.4	450	37.9
70	38.4	500	38.1
80	38.4	550	38.2
90	38.4	600	38.1
100	38.3	650	37.9
125	38.4	700	37.9
150	38.4	750	37.7
175	38.2	800	37.4
200	38.4	850	37.6
225	38.2	900	37.4
250	38.3	950	36.7
275	38.5	1000	37.0

COM-POWER PA-122

MICROWAVE PREAMPLIFIER

S/N: 25196

CALIBRATION DATE: JANUARY 10, 2003

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	32.3	6.0	27.9
1.1	32.6	6.5	28.9
1.2	32.4	7.0	29.2
1.3	32.1	7.5	29.3
1.4	31.8	8.0	29.4
1.5	31.7	8.5	28.5
1.6	31.6	9.0	28.7
1.7	31.6	9.5	27.9
1.8	31.0	10.0	27.0
1.9	32.0	11.0	26.9
2.0	31.0	12.0	28.7
2.5	30.5	13.0	28.6
3.0	30.5	14.0	28.7
3.5	30.0	15.0	27.1
4.0	30.0	16.0	26.1
4.5	29.9	17.0	26.0
5.0	29.7	18.0	23.9
5.5	30.2		

ANTENNA RESEARCH DRG-118/A

HORN ANTENNA

S/N: 1053

CALIBRATION DATE: JANUARY 13, 2002

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	25.5	10.0	39.7
1.5	26.6	10.5	40.9
2.0	29.4	11.0	40.7
2.5	30.4	11.5	42.4
3.0	31.2	12.0	42.6
3.5	32.3	12.5	42.4
4.0	32.9	13.0	41.5
4.5	33.0	13.5	41.0
5.0	34.8	14.0	40.5
5.5	35.2	14.5	43.6
6.0	36.4	15.0	43.7
6.5	36.6	15.5	43.3
7.0	38.8	16.0	42.8
7.5	38.8	16.5	43.0
8.0	38.0	17.0	42.7
8.5	38.1	17.5	44.0
9.0	39.9	18.0	41.8
9.5	39.1		

COM-POWER AL-130

LOOP ANTENNA

S/N: 17070

CALIBRATION DATE: JUNE 19, 2002

FREQUENCY (MHz)	MAGNETIC (dB/m)	ELECTRIC (dB/m)
0.009	-40.4	11.1
0.01	-40.3	11.2
0.02	-41.2	10.3
0.05	-41.6	9.9
0.07	-41.4	10.1
0.1	-41.7	9.8
0.2	-44.0	7.5
0.3	-41.6	9.9
0.5	-41.3	10.2
0.7	-41.4	10.1
1	-40.9	10.6
2	-40.6	10.9
3	-40.5	11.0
4	-40.8	10.7
5	-40.2	11.3
10	-40.7	10.8
15	-41.4	10.1
20	-41.6	9.9
25	-41.7	9.8
30	-42.9	8.6

FRONT VIEW

FEDERAL SIGNAL CORPORATION
WIRELESS INTERFACE UNIT
MODEL: ADWI
FCC SUBPART B AND C - RADIATED EMISSIONS – 08-21-03

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

REAR VIEW

FEDERAL SIGNAL CORPORATION
WIRELESS INTERFACE UNIT
MODEL: ADWI
FCC SUBPART B AND C - RADIATED EMISSIONS – 08-21-03

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

FRONT VIEW

FEDERAL SIGNAL CORPORATION
WIRELESS INTERFACE UNIT
MODEL: ADWI
FCC SUBPART B AND C - CONDUCTED EMISSIONS – 08-21-03

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

REAR VIEW

FEDERAL SIGNAL CORPORATION
WIRELESS INTERFACE UNIT
MODEL: ADWI
FCC SUBPART B AND C - CONDUCTED EMISSIONS – 08-21-03

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

APPENDIX E

DATA SHEETS

RADIATED EMISSIONS

DATA SHEETS

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.249)

COMPANY	**Federal Signal Corporation**	**DATE**	**8/21/03**	
EUT	**Wireless Interface Unit**	**DUTY CYCLE**	**N/A**	**%**
MODEL	**ADWI**	**PEAK TO AVG**	**N/A**	**dB**
S/N	**N/A**	**TEST DIST.**	**3**	**Meters**
TEST ENGINEER	**Kyle Fujimoto**	**LAB**	**D**	

Frequency MHz	Peak Reading (dBuV)	Average (A) or Quasi-Peak (QP)	Antenna Polar. (V or H)	Antenna Height (meters)	EUT Azimuth (degrees)	EUT Axis (X,Y,Z)	EUT Tx Channel	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	Distance Factor (dB)	Mixer Factor (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
903.3000	51.7	A	H	1.0	90			21.3	5.7	0.0	0.0	0.0	**78.7**	**-15.3**	**94.0**	
903.3000	61.8	A	V	1.5	0			21.3	5.7	0.0	0.0	0.0	**88.8**	**-5.2**	**94.0**	
912.3000	56.0	A	H	1.0	270			21.5	5.7	0.0	0.0	0.0	**83.2**	**-10.8**	**94.0**	
912.3000	61.9	A	V	1.0	0			21.5	5.7	0.0	0.0	0.0	**89.1**	**-4.9**	**94.0**	
921.3000	56.5	A	H	2.0	0			21.8	5.7	0.0	0.0	0.0	**84.0**	**-10.0**	**94.0**	
921.3000	61.0	A	V	1.5	90			21.8	5.7	0.0	0.0	0.0	**88.5**	**-5.5**	**94.0**	

* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN

** DELTA = SPEC LIMIT - CORRECTED READING

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.249)

COMPANY	**Federal Signal Corporation**	**DATE**	**8/21/03**	
EUT	**Wireless Interface Unit**	**DUTY CYCLE**	**N/A**	**%**
MODEL	**ADWI**	**PEAK TO AVG**	**N/A**	**dB**
S/N	**N/A**	**TEST DIST.**	**3**	**Meters**
TEST ENGINEER	**Kyle Fujimoto**	**LAB**	**D**	

Frequency MHz	Peak Reading (dBuV)	Average (A) or Quasi-Peak (QP)	Antenna Polar. (V or H)	Antenna Height (meters)	EUT Azimuth (degrees)	EUT Axis (X,Y,Z)	EUT Tx Channel	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	Distance Factor (dB)	Mixer Factor (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
1806.6000	50.7	47.9 A	H	1.0	90	Y	LOW	28.3	2.2	31.1	0.0	0.0	**47.4**	**-6.6**	**54.0**	
1806.6000	50.1	44.1 A	V	1.0	90	Y	LOW	28.3	2.2	31.1	0.0	0.0	**43.5**	**-10.5**	**54.0**	
1824.6000	50.5	43.9 A	H	1.0	90	Y	MID	28.4	2.2	31.2	0.0	0.0	**43.3**	**-10.7**	**54.0**	
1824.6000	53.9	49.4 A	V	1.5	0	Y	MID	28.4	2.2	31.2	0.0	0.0	**48.8**	**-5.2**	**54.0**	
1842.6000	49.9	46.7 A	H	1.0	0	Y	HIGH	28.5	2.2	31.4	0.0	0.0	**46.0**	**-8.0**	**54.0**	
1842.6000	53.9	49.3 A	V	1.5	180	Y	HIGH	28.5	2.2	31.4	0.0	0.0	**48.6**	**-5.4**	**54.0**	

* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN

** DELTA = SPEC LIMIT - CORRECTED READING

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.249)

COMPANY	**Federal Signal Corporation**	**DATE**	**8/21/03**	
EUT	**Wireless Interface Unit**	**DUTY CYCLE**	**N/A**	**%**
MODEL	**ADWI**	**PEAK TO AVG**	**N/A**	**dB**
S/N	**N/A**	**TEST DIST.**	**3**	**Meters**
TEST ENGINEER	**Kyle Fujimoto**	**LAB**	**D**	

Frequency MHz	Peak Reading (dBuV)	Average (A) or Quasi-Peak (QP)	Antenna Polar. (V or H)	Antenna Height (meters)	EUT Azimuth (degrees)	EUT Axis (X,Y,Z)	EUT Tx Channel	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	Distance Factor (dB)	Mixer Factor (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
2709.9000	46.1	42.5 A	H	1.0	0	Y	LOW	30.7	2.7	30.5	0.0	0.0	**45.4**	**-8.6**	**54.0**	
2709.9000	52.5	45.7 A	V	1.0	90	Y	LOW	30.7	2.7	30.5	0.0	0.0	**48.6**	**-5.4**	**54.0**	
2736.9000	49.4	42.4 A	H	1.5	90	Y	MID	30.8	2.7	30.5	0.0	0.0	**45.4**	**-8.6**	**54.0**	
2736.9000	50.2	43.7 A	V	2.0	0	Y	MID	30.8	2.7	30.5	0.0	0.0	**46.7**	**-7.3**	**54.0**	
2763.9000	48.3	44.5 A	H	1.0	90	Y	HIGH	30.8	2.7	30.5	0.0	0.0	**47.5**	**-6.5**	**54.0**	
2763.9000	48.6	44.7 A	V	1.5	90	Y	HIGH	30.8	2.7	30.5	0.0	0.0	**47.7**	**-6.3**	**54.0**	

* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN

** DELTA = SPEC LIMIT - CORRECTED READING

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.249)

COMPANY	**Federal Signal Corporation**	**DATE**	**8/21/03**	
EUT	**Wireless Interface Unit**	**DUTY CYCLE**	**N/A**	**%**
MODEL	**ADWI**	**PEAK TO AVG**	**N/A**	**dB**
S/N	**N/A**	**TEST DIST.**	**3**	**Meters**
TEST ENGINEER	**Kyle Fujimoto**	**LAB**	**D**	

Frequency MHz	Peak Reading (dBuV)	Average (A) or Quasi-Peak (QP)	Antenna Polar. (V or H)	Antenna Height (meters)	EUT Azimuth (degrees)	EUT Axis (X,Y,Z)	EUT Tx Channel	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	Distance Factor (dB)	Mixer Factor (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
3613.2000	50.5	47.8 A	H	1.0	90			32.4	3.3	30.0	0.0	0.0	**53.5**	**-0.5**	**54.0**	
3613.2000	53.3	48.1 A	V	1.0	180			32.4	3.3	30.0	0.0	0.0	**53.8**	**-0.2**	**54.0**	
3649.2000	50.8	45.5 A	H	1.5	90			32.5	3.2	30.0	0.0	0.0	**51.2**	**-2.8**	**54.0**	
3649.2000	52.0	47.1 A	V	1.5	180			32.5	3.2	30.0	0.0	0.0	**52.9**	**-1.1**	**54.0**	
3685.2000	50.1	46.7 A	H	1.5	90			32.5	3.2	30.0	0.0	0.0	**52.4**	**-1.6**	**54.0**	
3685.2000	51.9	47.5 A	V	1.0	270			32.5	3.2	30.0	0.0	0.0	**53.2**	**-0.8**	**54.0**	

* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN

** DELTA = SPEC LIMIT - CORRECTED READING

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.249)

COMPANY	**Federal Signal Corporation**	**DATE**	**8/21/03**	
EUT	**Wireless Interface Unit**	**DUTY CYCLE**	**N/A**	**%**
MODEL	**ADWI**	**PEAK TO AVG**	**N/A**	**dB**
S/N	**N/A**	**TEST DIST.**	**3**	**Meters**
TEST ENGINEER	**Kyle Fujimoto**	**LAB**	**D**	

Frequency MHz	Peak Reading (dBuV)	Average (A) or Quasi-Peak (QP)	Antenna Polar. (V or H)	Antenna Height (meters)	EUT Azimuth (degrees)	EUT Axis (X,Y,Z)	EUT Tx Channel	Antenna Factor (dB)	Cable Loss (dB)	Amplifier Gain (dB)	Distance Factor (dB)	Mixer Factor (dB)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
4516.5000	46.7	41.5 A	H	1.0	90			33.1	3.5	29.9	0.0	0.0	**48.2**	**-5.8**	**54.0**	**No Harmonics nor**
																Emissions Found after
																the 5th Harmonic
4516.5000	48.9	41.2 A	V	1.0	90			33.1	3.5	29.9	0.0	0.0	**47.9**	**-6.1**	**54.0**	
4561.5000	48.0	37.6 A	H	1.5	90			33.2	3.6	29.9	0.0	0.0	**44.5**	**-9.5**	**54.0**	
4561.5000	47.3	36.9 A	V	1.0	0			33.2	3.6	29.9	0.0	0.0	**43.8**	**-10.2**	**54.0**	
4606.5000	43.6	38.2 A	H	1.0	0			33.4	3.6	29.9	0.0	0.0	**45.4**	**-8.6**	**54.0**	
4606.5000	44.5	39.5 A	V	1.0	0			33.4	3.6	29.9	0.0	0.0	**46.7**	**-7.3**	**54.0**	

* CORRECTED READING = METER READING + ANTENNA FACTOR + CABLE LOSS - AMPLIFIER GAIN

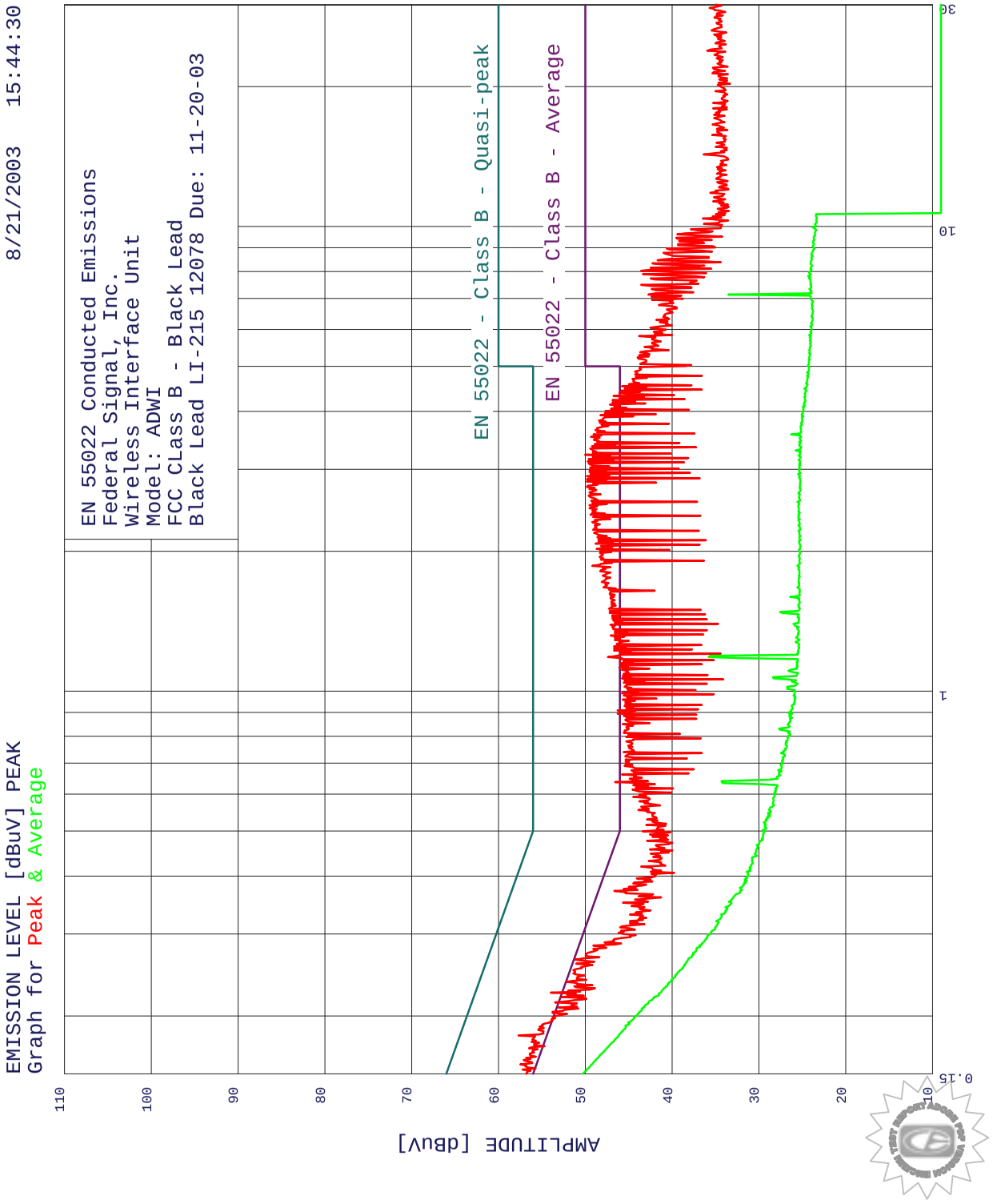
** DELTA = SPEC LIMIT - CORRECTED READING

Test Location : Compatible Electronics **Page** : 1/1
Customer : Federal Singal Corporation **Date** : 8/21/2003
Manufacturer : Federal Signal Corporation **Time** : 14:42:42
Eut name : Wireless Interface Unit **Lab** : D
Model : ADWI **Test Distance** : 3.0 Meters
Serial # : N/A
Specification : FCC Class B
Distance correction factor (20 * log(test/spec)) : 0.00
Test Mode : Spurious and Receiver Emissions
10 kHz to 9300 MHz - Vertical and Horizontal Polarizations
No Spurious nor Receiver Emissions found above 886.740 MHz
Tested By: Kyle Fujimoto

Pol	Freq	Rdng	Cable loss	Ant factor	Amp gain	Cor'd rdg = R	Limit = L	Delta R-L
	MHz	dBuV	dB	dB	dB	dBuV	dBuV/m	dB
1H	299.960	36.80	3.30	19.10	38.30	20.90	46.00	-25.10
2H	303.960	37.60	3.33	13.21	38.30	15.84	46.00	-30.16
3H	306.960	37.80	3.34	13.29	38.30	16.14	46.00	-29.86
4H	307.920	34.10	3.35	13.32	38.30	12.47	46.00	-33.53
5V	868.703	41.40	5.41	21.20	37.52	30.49	46.00	-15.51
6H	868.750	37.80	5.41	21.20	37.52	26.89	46.00	-19.11
7V	877.720	37.00	5.47	21.20	37.49	26.18	46.00	-19.82
8H	877.720	32.90	5.47	21.20	37.49	22.08	46.00	-23.92
9H	886.736	40.80	5.52	21.20	37.45	30.07	46.00	-15.93
10V	886.740	39.50	5.52	21.20	37.45	28.77	46.00	-17.23

CONDUCTED EMISSIONS

DATA SHEETS


8/21/2003 15:44:30
EN 55022 Conducted Emissions
Federal Signal, Inc.
Wireless Interface Unit
Model: ADWI
FCC Class B - Black Lead
Black Lead LI-215 12078 Due: 11-20-03
EN 55022 - Class B - Quasi-peak
EN 55022 - Class B - Average
EMISSION LEVEL [dBuV] PEAK
Graph for Peak & Average
AMPLITUDE [dBuV]
FREQUENCY [MHz]
110
100
90
80
70
60
50
40
30
20
10
0.15
1
10
30

EN 55022 Conducted Emissions
Federal Signal, Inc.
Wireless Interface Unit
Model: ADWI
FCC CLass B - Black Lead
Black Lead LI-215 12078 Due: 11-20-03
TEST ENGINEER : Kyle Fujimoto

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40 highest peaks above -50.00 dB of EN 55022 - Class B - Average limit line
Peak criteria : 3.00 dB, Curve : Peak

Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	3.226	50.02	46.00	4.02**
2	2.900	49.81	46.00	3.81**
3	2.855	49.81	46.00	3.81**
4	2.751	49.81	46.00	3.81**
5	3.124	49.71	46.00	3.71**
6	3.091	49.61	46.00	3.61**
7	2.995	49.51	46.00	3.51**
8	2.514	49.50	46.00	3.50**
9	3.328	49.42	46.00	3.42**
10	3.529	49.33	46.00	3.33**
11	3.365	49.22	46.00	3.22**
12	2.310	49.20	46.00	3.20**
13	1.859	49.19	46.00	3.19**
14	2.190	49.00	46.00	3.00**
15	3.644	48.83	46.00	2.83**
16	2.077	48.79	46.00	2.79**
17	2.023	48.69	46.00	2.69**
18	3.820	48.43	46.00	2.43**
19	2.002	48.29	46.00	2.29**
20	3.924	48.24	46.00	2.24**
21	3.966	47.74	46.00	1.74**
22	1.184	47.38	46.00	1.38**
23	0.224	53.96	52.65	1.31**
24	1.504	47.28	46.00	1.28**
25	1.488	47.18	46.00	1.18**
26	4.137	47.14	46.00	1.14**
27	1.389	47.08	46.00	1.08**
28	1.318	47.08	46.00	1.08**
29	1.456	46.88	46.00	0.88**
30	4.227	46.85	46.00	0.85**
31	1.419	46.78	46.00	0.78**
32	4.316	46.75	46.00	0.75**
33	1.249	46.68	46.00	0.68**
34	1.223	46.68	46.00	0.68**
35	1.345	46.58	46.00	0.58**
36	0.637	46.57	46.00	0.57**
37	0.909	46.27	46.00	0.27**
38	1.124	46.08	46.00	0.08**
39	4.384	46.05	46.00	0.05**
40	1.148	45.98	46.00	-0.02**

EN 55022 Conducted Emissions
Federal Signal, Inc.
Wireless Interface Unit
Model: ADWI
FCC CLass B - Black Lead
Black Lead LI-215 12078 Due: 11-20-03
TEST ENGINEER : Kyle Fujimoto

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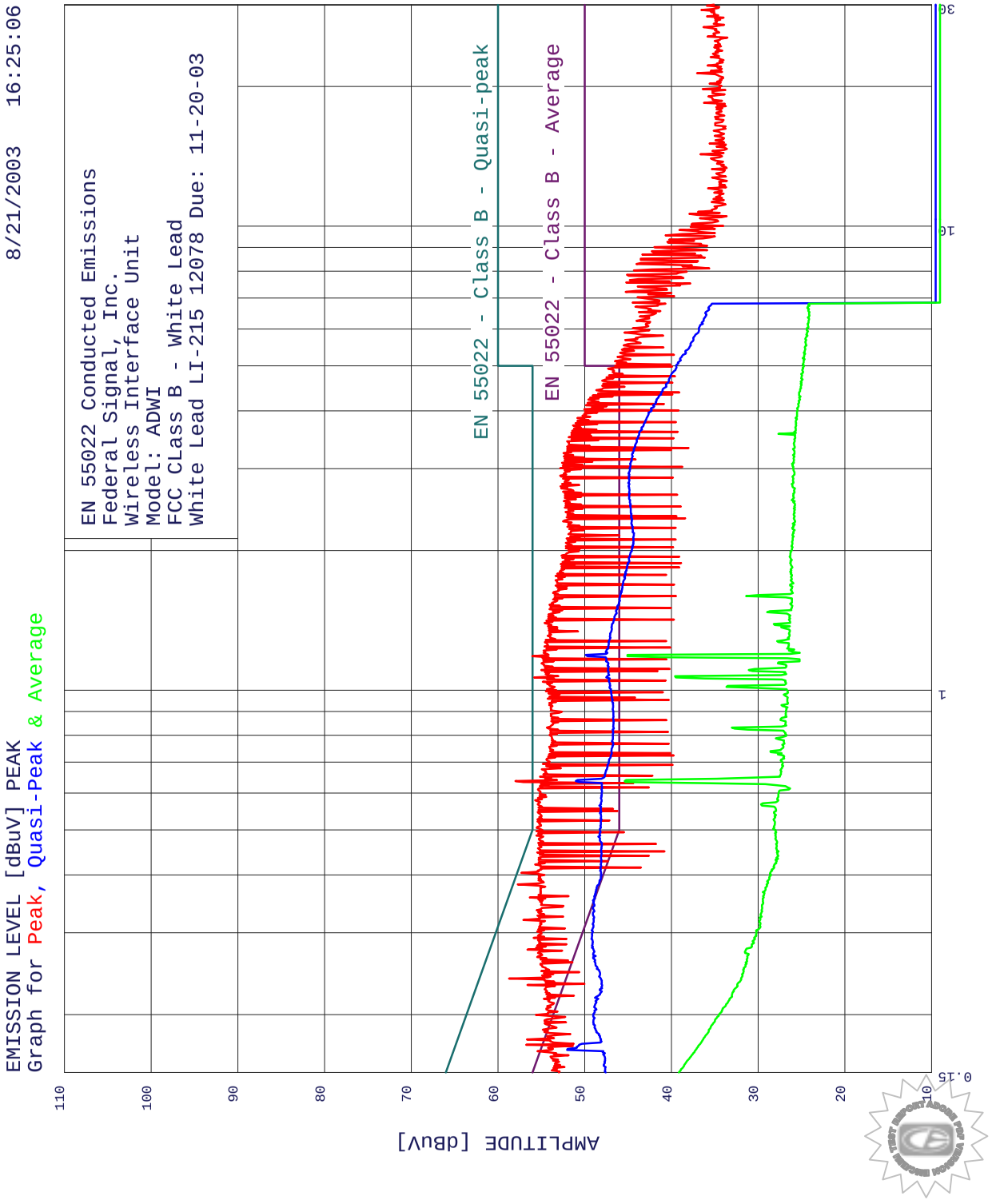
40 highest peaks above -50.00 dB of EN 55022 - Class B - Average limit line
Peak criteria : 0.10 dB, Curve : Average

Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	0.190	45.40	54.01	-8.62
2	0.194	45.06	53.88	-8.83
3	1.184	35.76	46.00	-10.24
4	0.641	34.30	46.00	-11.70
5	0.320	34.91	49.71	-14.80
6	0.331	34.36	49.44	-15.08
7	0.343	33.84	49.13	-15.29
8	0.338	33.86	49.26	-15.40
9	0.352	33.45	48.91	-15.46
10	0.377	32.19	48.34	-16.15
11	0.409	31.40	47.68	-16.27
12	0.438	30.81	47.11	-16.29
13	0.466	30.26	46.58	-16.31
14	0.398	31.51	47.90	-16.39
15	0.393	31.60	47.99	-16.39
16	0.417	31.06	47.50	-16.44
17	0.389	31.63	48.08	-16.44
18	0.502	29.55	46.00	-16.45
19	0.447	30.46	46.93	-16.47
20	7.139	33.52	50.00	-16.48
21	0.521	29.42	46.00	-16.58
22	0.481	29.66	46.32	-16.65
23	0.510	29.33	46.00	-16.67
24	0.516	29.30	46.00	-16.70
25	0.535	29.07	46.00	-16.93
26	0.547	28.96	46.00	-17.04
27	0.541	28.92	46.00	-17.08
28	0.555	28.84	46.00	-17.16
29	0.573	28.39	46.00	-17.61
30	1.072	28.36	46.00	-17.64
31	0.605	28.22	46.00	-17.78
32	0.676	27.78	46.00	-18.22
33	0.669	27.69	46.00	-18.31
34	0.831	27.64	46.00	-18.36
35	1.480	27.56	46.00	-18.44
36	0.694	27.51	46.00	-18.49
37	0.735	27.46	46.00	-18.54
38	0.701	27.37	46.00	-18.63
39	0.709	27.32	46.00	-18.68
40	0.720	27.27	46.00	-18.73


8/21/2003 16:25:06
EN 55022 Conducted Emissions
Federal Signal, Inc.
Wireless Interface Unit
Model: ADWI
FCC Class B - White Lead
White Lead LI-215 12078 Due: 11-20-03
EMISSION LEVEL [dBuV] PEAK
Graph for Peak, Quasi-Peak & Average
EN 55022 - Class B - Quasi-peak
EN 55022 - Class B - Average
AMPLITUDE [dBuV]
FREQUENCY [MHz]
110
100
90
80
70
60
50
40
30
20
10
0.15
1
30

EN 55022 Conducted Emissions
Federal Signal, Inc.
Wireless Interface Unit
Model: ADWI
FCC CLass B - White Lead
WhiteLead LI-215 12078 Due: 11-20-03
TEST ENGINEER : Kyle Fujimoto

40 highest peaks above -50.00 dB of EN 55022 - Class B - Average limit line
Peak criteria : 3.00 dB, Curve : Peak

Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	0.637	57.97	46.00	11.97**
2	1.184	56.04	46.00	10.04**
3	1.066	55.81	46.00	9.81**
4	0.580	55.70	46.00	9.70**
5	0.497	55.55	46.05	9.50**
6	0.381	57.72	48.25	9.47**
7	0.527	55.43	46.00	9.43**
8	0.486	55.56	46.23	9.33**
9	0.552	55.32	46.00	9.32**
10	0.621	55.18	46.00	9.18**
11	1.106	54.99	46.00	8.99**
12	1.142	54.97	46.00	8.97**
13	0.676	54.94	46.00	8.94**
14	0.694	54.83	46.00	8.83**
15	1.043	54.83	46.00	8.83**
16	0.457	55.37	46.76	8.62**
17	1.397	54.62	46.00	8.62**
18	1.243	54.61	46.00	8.61**
19	0.447	55.48	46.93	8.55**
20	1.283	54.48	46.00	8.48**
21	0.831	54.35	46.00	8.35**
22	0.958	54.28	46.00	8.28**
23	0.421	55.69	47.42	8.28**
24	1.426	54.20	46.00	8.20**
25	0.984	54.16	46.00	8.16**
26	0.728	54.11	46.00	8.11**
27	0.755	54.10	46.00	8.10**
28	0.929	54.09	46.00	8.09**
29	0.801	54.07	46.00	8.07**
30	1.528	54.05	46.00	8.05**
31	0.431	55.29	47.24	8.05**
32	1.620	53.65	46.00	7.65**
33	0.358	56.33	48.78	7.55**
34	1.763	53.36	46.00	7.36**
35	0.320	57.05	49.71	7.35**
36	1.781	53.16	46.00	7.16**
37	3.011	52.81	46.00	6.81**
38	2.751	52.80	46.00	6.80**
39	1.869	52.76	46.00	6.76**
40	1.950	52.67	46.00	6.67**

** Please see the Quasi-Peak and Average table charts on the next two pages. Also please see the plot.

EN 55022 Conducted Emissions
Federal Signal, Inc.
Wireless Interface Unit
Model: ADWI
FCC CLass B - White Lead
White Lead LI-215 12078 Due: 11-20-03
TEST ENGINEER : Kyle Fujimoto

40 highest peaks above -50.00 dB of EN 55022 - Class B - Quasi-peak limit line
Peak criteria : 0.10 dB, Curve : Quasi-peak

Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	0.637	51.01	56.00	-4.99
2	1.191	49.86	56.00	-6.14
3	0.564	48.30	56.00	-7.70
4	0.500	48.26	56.01	-7.75
5	0.544	48.24	56.00	-7.76
6	0.484	48.42	56.27	-7.86
7	1.210	47.56	56.00	-8.44
8	1.066	47.50	56.00	-8.50
9	1.130	47.35	56.00	-8.65
10	1.100	47.32	56.00	-8.68
11	1.049	47.21	56.00	-8.79
12	0.775	46.85	56.00	-9.15
13	0.415	48.23	57.55	-9.32
14	1.480	46.40	56.00	-9.60
15	0.352	49.06	58.91	-9.85
16	0.339	49.08	59.22	-10.14
17	0.329	49.03	59.48	-10.45
18	1.754	45.44	56.00	-10.56
19	1.790	45.32	56.00	-10.68
20	0.313	49.08	59.88	-10.80
21	0.304	49.18	60.14	-10.96
22	2.796	44.96	56.00	-11.04
23	2.932	44.94	56.00	-11.06
24	0.291	49.23	60.49	-11.26
25	2.358	44.68	56.00	-11.32
26	2.286	44.61	56.00	-11.39
27	3.226	44.54	56.00	-11.46
28	0.279	49.15	60.85	-11.70
29	0.269	49.01	61.15	-12.14
30	0.265	49.02	61.29	-12.27
31	0.260	48.87	61.42	-12.55
32	0.168	52.01	65.07	-13.06
33	0.242	48.32	62.04	-13.72
34	4.114	42.10	56.00	-13.90
35	0.217	48.80	62.91	-14.12
36	0.214	48.75	63.05	-14.30
37	0.227	48.25	62.57	-14.32
38	0.229	48.08	62.48	-14.40
39	0.207	48.88	63.31	-14.43
40	0.199	49.02	63.67	-14.65

EN 55022 Conducted Emissions
Federal Signal, Inc.
Wireless Interface Unit
Model: ADWI
FCC CLass B - White Lead
White Lead LI-215 12078 Du: 11-20-03
TEST ENGINEER : Kyle Fujimoto

40 highest peaks above -50.00 dB of EN 55022 - Class B - Average limit line
Peak criteria : 0.10 dB, Curve : Average

Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	0.637	45.38	46.00	-0.62
2	1.184	45.07	46.00	-0.93
3	1.072	39.56	46.00	-6.44
4	1.016	33.63	46.00	-12.37
5	0.831	33.03	46.00	-12.97
6	1.594	31.36	46.00	-14.64
7	1.106	31.08	46.00	-14.92
8	0.567	29.65	46.00	-16.35
9	1.472	28.96	46.00	-17.04
10	0.739	28.57	46.00	-17.43
11	0.502	28.27	46.00	-17.73
12	0.527	28.20	46.00	-17.80
13	1.389	28.18	46.00	-17.82
14	0.544	28.15	46.00	-17.85
15	0.788	27.96	46.00	-18.04
16	0.492	28.04	46.14	-18.10
17	1.276	27.81	46.00	-18.19
18	0.583	27.80	46.00	-18.20
19	0.728	27.71	46.00	-18.29
20	1.142	27.71	46.00	-18.29
21	3.565	27.66	46.00	-18.34
22	0.862	27.39	46.00	-18.61
23	0.705	27.39	46.00	-18.61
24	1.367	27.33	46.00	-18.67
25	0.929	27.30	46.00	-18.70
26	0.690	27.25	46.00	-18.75
27	0.763	27.20	46.00	-18.80
28	0.457	27.92	46.76	-18.83
29	0.716	27.08	46.00	-18.92
30	0.979	27.02	46.00	-18.98
31	0.447	27.83	46.93	-19.10
32	0.367	29.46	48.56	-19.11
33	0.402	28.64	47.81	-19.17
34	0.387	28.94	48.12	-19.17
35	0.431	27.99	47.24	-19.25
36	0.435	27.89	47.15	-19.26
37	1.230	26.67	46.00	-19.33
38	1.297	26.58	46.00	-19.42
39	0.273	31.53	51.02	-19.49
40	1.325	26.46	46.00	-19.54