

FCC PART 15, SUBPART C
TEST METHOD: ANSI C63.4-1992

for

FAN CONTROLLER

MODEL: SW350

Prepared for

EMERSON ELECTRIC COMPANY
8400 PERSHALL ROAD
HAZELWOOD, MISSOURI 63042

Prepared by:_____

KYLE FUJIMOTO

Approved by:_____

MICHAEL CHRISTENSEN

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DATE: JUNE 5, 2000

	REPORT BODY	APPENDICES					TOTAL
		A	B	C	D	E	
PAGES	16	2	2	13	23	2	58

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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 or any other agency of the U.S. Government.

Device Tested: Fan Controller
Model: SW350
S/N: N/A

Product Description: See Expository Statement.

Modifications: The EUT was not modified during the testing.

Customer: Emerson Electric Company
8400 Pershall Road
Hazlewood, Missouri 63042

Test Date: May 24, 2001

Test Specifications: EMI requirements
CFR Title 47, Part 15 Subpart C, Sections 15.205, 15.207, 15.209, and 15.231

Test Procedure: ANSI C63.4: 1992

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

SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	RESULTS
1	Conducted RF Emissions, 450 kHz - 30 MHz	Complies with the CFR Title 47, Part 15 Subpart C, section 15.207 using the limits of section 15.207 (b)
2	Radiated RF Emissions, 10 kHz - 4500 MHz	Complies with the CFR Title 47, Part 15 Subpart C, sections 15.205, 15.209, and 15.231



1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the Fan Controller Model: SW350. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4: 1992. 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 specification limits defined by CFR Title 47, Part 15, Subpart C, sections 15.205, 15.207, 15.209, and 15.231.



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

Emerson Electric Company

Craig Johnson Engineer

Compatible Electronics Inc.

Kyle Fujimoto Test Engineer

Michael Christensen Test Engineer

2.4 Date Test Sample was Received

The test sample was received on May 24, 2001.

2.5 Disposition of the Test Sample

The test sample was returned to Emerson Electric Company on May 25, 2001.

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
CFR	Code of Federal Regulations



3. APPLICABLE DOCUMENTS

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

SPEC	TITLE
CFR Title 47, Subpart C	FCC Rules – Radio frequency devices (including digital devices) – Intentional Radiators
ANSI C63.4 1992	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 Fan Controller Model: SW350 (EUT) was connected to a light bulb and tested in the vertical axis, which is how the EUT will always be used. The EUT was continuously transmitting during the test. The antenna is a PCB trace. The EUT turns immediately off after the button is released.

Final radiated as well as the conducted data was taken in the mode above.



4.1.1 Cable Construction and Termination

Cables 1-2

These are 2 meter unshielded cables connecting the EUT to the light bulb. They are hard wired at each end. The cables were bundled to a length of 1 meter.



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

EQUIPMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC ID
FAN CONTROLLER (EUT)	EMERSON ELECTRIC COMPANY	SW350	N/A	F92SW350
LIGHT BULB	N/A	N/A	N/A	N/A



5.2 EMI Test Equipment

EQUIPMENT TYPE	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
Spectrum Analyzer	Hewlett Packard	8566B	3701A22262	June 24, 2000	June 24, 2001
Preamplifier	Com Power	PA-102	1017	Jan. 5, 2001	Jan. 5, 2002
Quasi-Peak Adapter	Hewlett Packard	85650A	2811A01363	June 24, 2000	June 24, 2001
Biconical Antenna	Com Power	AB-100	1548	Oct. 16, 2000	Oct. 16, 2001
Log Periodic Antenna	Com Power	AL-100	16101	Oct. 16, 2000	Oct. 16, 2001
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	HP98561A	2522A05178	N/A	N/A
Printer	Hewlett Packard	2225A	2925S33268	N/A	N/A
Plotter	Hewlett Packard	7440A	8726K38417	N/A	N/A
Microwave Preamplifier	Com-Power	PA-122	25195	Jan. 9, 2001	Jan. 9, 2002
Horn Antenna	Antenna Research	DRG-118/A	1053	Jan. 15, 2001	Jan. 15, 2002
Loop Antenna	Com-Power	AL-130	25309	May 25, 2000	May 25, 2001



6. TEST SITE DESCRIPTION

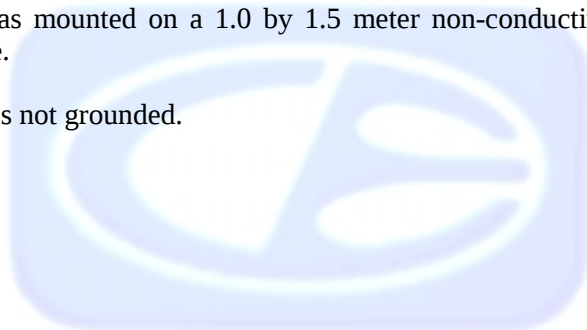
6.1 Test Facility Description

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: 1992. 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.

Note: The readings were also averaged where the Quasi-Peak reading was over the FCC 15.207 (a) limit. If the average reading was shown to be at least 6 dB below the Quasi-Peak reading, the Quasi-Peak spec limit was increased by 13 dB and the Quasi-Peak readings were then compared to the new increased limit.

Test Results:

The EUT complies with the limits of Section 15.207 (b) of CFR Title 47, Part 15, Subpart C for conducted emissions.



7.2 Radiated Emissions (Spurious and Harmonics) Test

The spectrum analyzer was 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 PA-122 Microwave Preamplifier was used for frequencies above 1 GHz. The spectrum analyzer was 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 quasi-peak adapter was used only for those readings which are marked accordingly on the data sheets. The measurement bandwidths and transducers used for the radiated emissions test were:

FREQUENCY RANGE	EFFECTIVE MEASUREMENT BANDWIDTH	TRANSDUCER
10 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 4.5 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: 1992. 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 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.



7.3 Bandwidth of the Fundamental

The -20 dB bandwidth was checked to see that it was within 0.25% of the fundamental frequency for the Fan Controller. A plot of the -20 dB bandwidth is in Appendix D.



8. CONCLUSIONS

The Fan Controller Model: SW350 meets all of the specification limits defined in CFR Title 47, Part 15, Subpart C, sections 15.205, 15.207, 15.209, and 15.231.



APPENDIX A

MODIFICATIONS TO THE EUT



MODIFICATIONS TO THE EUT

The modifications listed below were made to the EUT to pass FCC 15.231 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.

Modifications:

No modifications were made to the EUT.



APPENDIX B

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



ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST

Fan Controller
Model: SW350
S/N: N/A

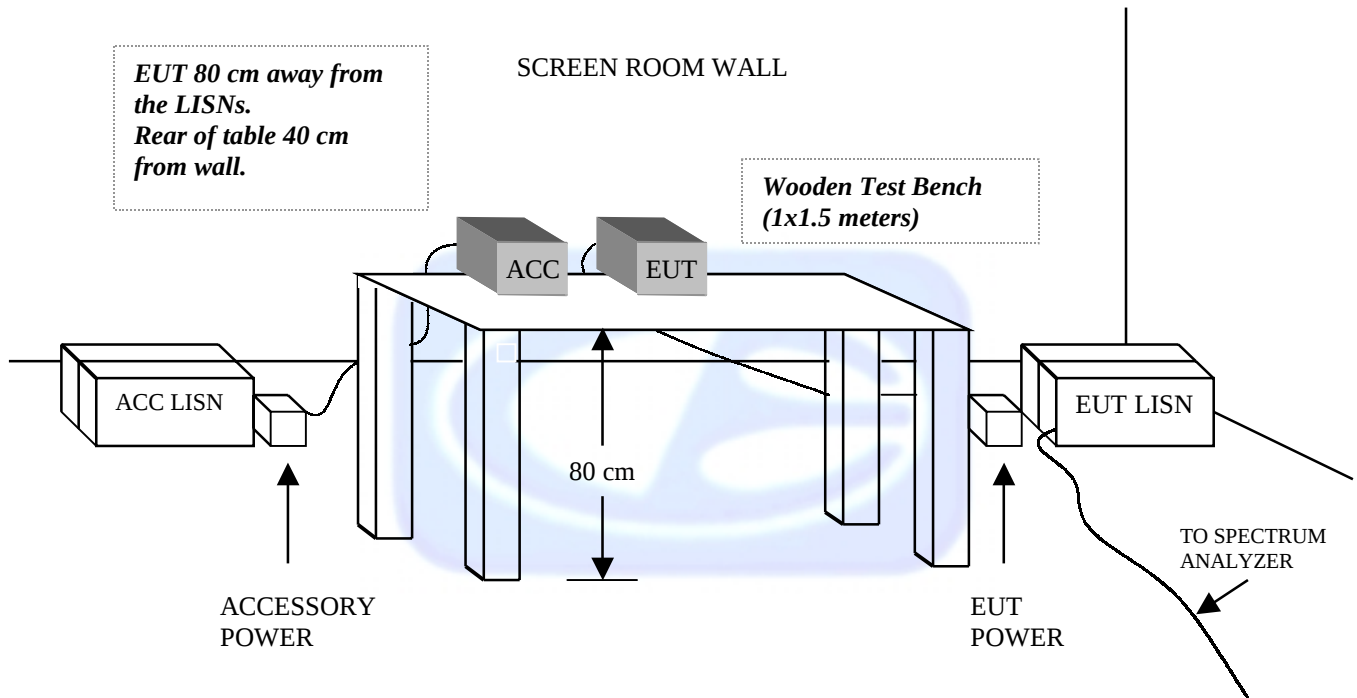
There were no additional models covered under this report.



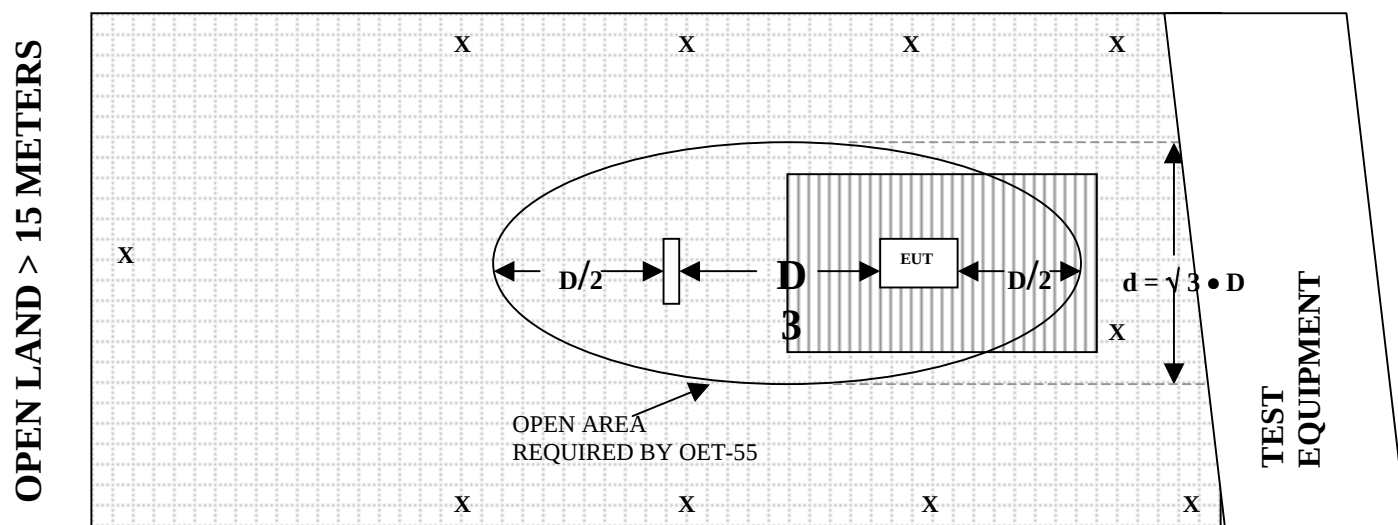
APPENDIX C

DIAGRAMS, CHARTS AND PHOTOS

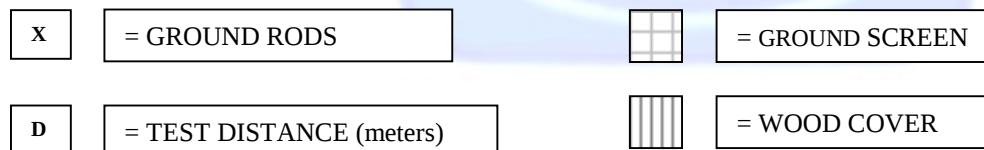


FIGURE 1: CONDUCTED EMISSIONS TEST SETUP

OPEN LAND > 15 METERS



OPEN LAND > 15 METERS





FRONT VIEW

EMERSON ELECTRIC COMPANY

FAN CONTROLLER

Model: SW350

FCC SUBPART C - RADIATED EMISSIONS – 5-24-01

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





REAR VIEW

EMERSON ELECTRIC COMPANY

FAN CONTROLLER

Model: SW350

FCC SUBPART C - RADIATED EMISSIONS – 5-24-01

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





FRONT VIEW

EMERSON ELECTRIC COMPANY

FAN CONTROLLER

Model: SW350

FCC SUBPART C - CONDUCTED EMISSIONS – 5-24-01

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





REAR VIEW

EMERSON ELECTRIC COMPANY

FAN CONTROLLER

Model: SW350

FCC SUBPART C - CONDUCTED EMISSIONS – 5-24-01

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



COM-POWER AB-100
BICONICAL ANTENNA

S/N: 01548

CALIBRATION DATE: OCTOBER 16, 2000

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	14.01	120	10.33
35	13.63	125	11.61
40	13.26	140	12.70
45	11.62	150	12.95
50	11.03	160	13.58
60	8.52	175	14.82
70	8.94	180	14.84
80	8.17	200	14.80
90	8.08	250	16.42
100	8.64	300	20.26



COM-POWER AL-100
LOG PERIODIC ANTENNA

S/N: 16101

CALIBRATION DATE: OCTOBER 16, 2000

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
300	12.96	700	19.24
400	16.92	800	21.37
500	16.73	900	22.13
600	16.32	1000	22.19



COM-POWER PA-102

PREAMPLIFIER

S/N: 1017

CALIBRATION DATE: JANUARY 11, 2000

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	38.3	300	38.6
40	38.6	350	38.6
50	38.7	400	38.6
60	38.8	450	38.1
70	38.9	500	37.9
80	38.8	550	39.2
90	38.6	600	38.3
100	38.6	650	38.4
125	38.8	700	38.3
150	38.8	750	38.2
175	38.7	800	37.7
200	38.8	850	37.5
225	38.6	900	37.5
250	38.6	950	37.7
275	38.5	1000	37.3



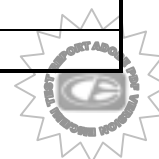
COM-POWER PA-122

MICROWAVE PREAMPLIFIER

S/N: 25195

CALIBRATION DATE: JANUARY 9, 2001

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	33.1	9.5	30.7
1.1	33.0	10.0	31.6
1.2	33.2	11.0	30.6
1.3	33.0	12.0	28.5
1.4	32.4	13.0	31.5
1.5	32.3	14.0	33.2
1.6	32.1	15.0	31.5
1.7	32.0	16.0	30.2
1.8	31.8	17.0	31.6
1.9	32.2	18.0	31.7
2.0	32.6		
2.5	31.9		
3.0	31.7		
3.5	31.7		
4.0	32.3		
4.5	31.5		
5.0	32.3		
5.5	34.2		
6.0	30.9		
6.5	32.0		
7.0	32.1		
7.5	33.0		
8.0	31.9		
8.5	31.9		
9.0	31.3		



ANTENNA RESEARCH DRG-118/A

HORN ANTENNA

S/N: 1053

CALIBRATION DATE: JANUARY 15, 2001

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	25.4	9.5	39.6
1.5	26.7	10.0	39.7
2.0	29.6	10.5	40.8
2.5	30.7	11.0	40.4
3.0	31.2	11.5	42.2
3.5	32.3	12.0	43.0
4.0	33.2	12.5	42.6
4.5	33.2	13.0	41.3
5.0	34.8	13.5	40.3
5.5	35.4	14.0	40.9
6.0	36.6	14.5	44.0
6.5	36.6	15.0	43.3
7.0	38.7	15.5	42.7
7.5	38.6	16.0	42.6
8.0	37.9	16.5	42.8
8.5	37.9	17.0	43.5
9.0	39.9	17.5	44.6
		18.0	42.2

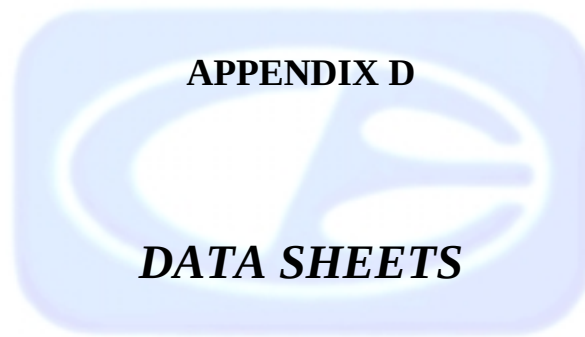


Com-Power Corporation

(949) 587-9800

Antenna Calibration

Antenna Type:		Loop Antenna
Model:		AL-130
Serial Number:		25309
Calibration Date:		05/25/00
Frequency MHz	Magnetic (dB/m)	Electric dB/m
0.009	-41.0	10.5
0.01	-41.0	10.5
0.02	-41.9	9.6
0.05	-41.9	9.6
0.075	-41.8	9.7
0.1	-42.2	9.3
0.15	-42.2	9.3
0.25	-40.7	10.8
0.5	-42.1	9.4
0.75	-40.9	10.6
1	-41.3	10.2
2	-40.8	10.7
3	-41.1	10.4
4	-41.2	10.3
5	-40.7	10.8
10	-40.6	10.9
15	-42.0	9.5
20	-42.0	9.5
25	-42.9	8.6
30	-42.3	9.2
Trans. Antenna Height		2 meter
Receiving Antenna Height		2 meter



RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.231)

COMPANY	EMERSON ELECTRIC	DATE	5/24/01
EUT	FAN CONTROLLER	DUTY CYCLE	12.50 %
MODEL	SW350	PEAK TO AVG	-18.06 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)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
417.5600	67.1	49.1 A	H	1.5	90	Y	LOW	16.9	3.3	0.0	69.2	-11.0	80.3	
417.5600	65.2	47.2 A	V	1.5	0	Y	LOW	16.9	3.3	0.0	67.3	-12.9	80.3	

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

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.231)

COMPANY	EMERSON ELECTRIC	DATE	5/24/01
EUT	FAN CONTROLLER	DUTY CYCLE	12.50 %
MODEL	SW350	PEAK TO AVG	-18.06 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)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
835.1200	80.4	62.4 A	H	1.0	270	Y	LOW	21.6	4.8	38.0	50.8	-9.5	60.3	
835.1200	83.5	65.5 A	V	1.0	180	Y	LOW	21.6	4.8	38.0	53.9	-6.4	60.3	

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

PAGE 2

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.231)

COMPANY	EMERSON ELECTRIC	DATE	5/24/01
EUT	FAN CONTROLLER	DUTY CYCLE	12.50 %
MODEL	SW350	PEAK TO AVG	-18.06 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)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
1252.6800	61.1	43.1 A	H	1.5	180	Y	LOW	26.1	2.6	33.1	38.6	-21.7	60.3	
1252.6800	66.5	48.5 A	V	1.5	90	Y	LOW	26.1	2.6	33.1	44.0	-16.3	60.3	

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

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.231)

COMPANY	EMERSON ELECTRIC	DATE	5/24/01
EUT	FAN CONTROLLER	DUTY CYCLE	12.50 %
MODEL	SW350	PEAK TO AVG	-18.06 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)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
1670.2400	52.7	34.7 A	H	1.5	270	Y	LOW	27.7	3.3	32.0	33.6	-20.4	54.0	
1670.2400	57.4	39.4 A	V	1.5	180	Y	LOW	27.7	3.3	32.0	38.3	-15.7	54.0	

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

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RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.231)

COMPANY	EMERSON ELECTRIC	DATE	5/24/01
EUT	FAN CONTROLLER	DUTY CYCLE	12.50 %
MODEL	SW350	PEAK TO AVG	-18.06 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)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
2087.8000	43.8	25.8 A	H	1.5	0	Y	LOW	29.8	3.6	32.5	26.7	-33.6	60.3	
2087.8000	50.3	32.3 A	V	1.0	180	Y	LOW	27.7	3.3	32.0	31.2	-22.8	54.0	

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

PAGE 5

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.231)

COMPANY	EMERSON ELECTRIC	DATE	5/24/01
EUT	FAN CONTROLLER	DUTY CYCLE	12.50 %
MODEL	SW350	PEAK TO AVG	-18.06 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)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
2505.3600	36.4	18.4 A	H	3.0	90	Y	LOW	30.7	3.5	31.9	20.7	-39.6	60.3	
2505.3600	39.8	21.8 A	V	2.0	270	Y	LOW	30.7	3.5	31.9	24.1	-36.2	60.3	

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

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.231)

COMPANY	EMERSON ELECTRIC	DATE	5/24/01
EUT	FAN CONTROLLER	DUTY CYCLE	12.50 %
MODEL	SW350	PEAK TO AVG	-18.06 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)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
2922.9200	45.7	27.7 A	H	1.0	0	Y	LOW	31.1	4.9	31.7	32.0	-28.3	60.3	
2922.9200	46.0	28.0 A	V	1.0	0	Y	LOW	31.1	4.9	31.7	32.3	-28.0	60.3	

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

** DELTA = SPEC LIMIT - CORRECTED READING

PAGE 7

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.231)

COMPANY	EMERSON ELECTRIC	DATE	5/24/01
EUT	FAN CONTROLLER	DUTY CYCLE	12.50 %
MODEL	SW350	PEAK TO AVG	-18.06 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)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
3340.4800	38.8	20.8 A	H	1.5	180	Y	LOW	31.9	4.9	31.7	26.0	-34.3	60.3	
3340.4800	39.8	21.8 A	V	1.5	270	Y	LOW	31.9	4.9	31.7	27.0	-33.3	60.3	

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

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.231)

COMPANY	EMERSON ELECTRIC	DATE	5/24/01
EUT	FAN CONTROLLER	DUTY CYCLE	12.50 %
MODEL	SW350	PEAK TO AVG	-18.06 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)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
3758.0400	38.0	20.0 A	H	2.0	270	Y	LOW	32.8	5.2	32.0	26.0	-28.0	54.0	
3758.0400	38.2	20.2 A	V	1.5	180	Y	LOW	32.8	5.2	32.0	26.2	-27.8	54.0	

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

RADIATED EMISSIONS (FCC SECTION 15.205 AND 15.231)

COMPANY	EMERSON ELECTRIC	DATE	5/24/01
EUT	FAN CONTROLLER	DUTY CYCLE	12.50 %
MODEL	SW350	PEAK TO AVG	-18.06 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)	*Corrected Reading (dBuV/m)	Delta ** (dB)	Spec Limit (dBuV/m)	Comments
4175.6000	37.5	19.5 A	H	1.5	90	Y	LOW	33.2	5.3	32.0	26.0	-28.0	54.0	
4175.6000	38.8	20.8 A	V	1.5	90	Y	LOW	33.2	5.3	32.0	27.3	-26.7	54.0	

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

Test location: Compatible Electronics
 Customer : EMERSON ELECTRIC Date : 5/24/2001
 Manufacturer : EMERSON ELECTRIC Time : 7.26
 EUT name : FAN CONTROLLER Model: SW350
 Specification: Fcc_B Test distance: 3.0 mtrs Lab: D
 Distance correction factor($20 \cdot \log(\text{test}/\text{spec})$) : 0.00
 Test Mode : SPURIOUS EMISSIONS FROM THE EUT
 VERTICAL POLARIZATION 30 MHz TO 1000 MHz
 TEMPERATURE 62 DEGREES F., RELATIVE HUMIDITY 95%
 TESTED BY: KYLE FUJIMOTO

Pol	Freq MHz	Rdng dBuV	Cable loss dB	Ant factor dB	Amp gain dB	Cor'd rdg = R dBuV	limit = L dBuV/m	Delta R-L dB
1V	39.41	46.60	0.99	13.30	39.19	21.71	40.00	-18.29
2V	49.22	54.40	1.09	11.12	39.20	27.41	40.00	-12.59
3V	370.12	35.50	3.12	15.73	38.78	15.57	46.00	-30.43
4V	434.92	35.10	3.23	16.85	38.53	16.65	46.00	-29.35
5V	647.72	36.90	4.18	17.71	38.51	20.28	46.00	-25.72
6V	650.92	37.10	4.20	17.81	38.50	20.61	46.00	-25.39

Test location: Compatible Electronics

Customer : EMERSON ELECTRIC

Date : 5/24/2001

Manufacturer : EMERSON ELECTRIC

Time : 7.04

EUT name : FAN CONTROLLER

Model: SW350

Specification: Fcc_B Test distance: 3.0 mtrs Lab: D

Distance correction factor($20 \cdot \log(\text{test}/\text{spec})$) : 0.00

Test Mode : SPURIOUS EMISSIONS FROM THE EUT

HORIZONTAL POLARIZATION 30 MHz TO 1000 MHz

TEMPERATURE 62 DEGREES F., RELATIVE HUMIDITY 95%

TESTED BY: KYLE FUJIMOTO

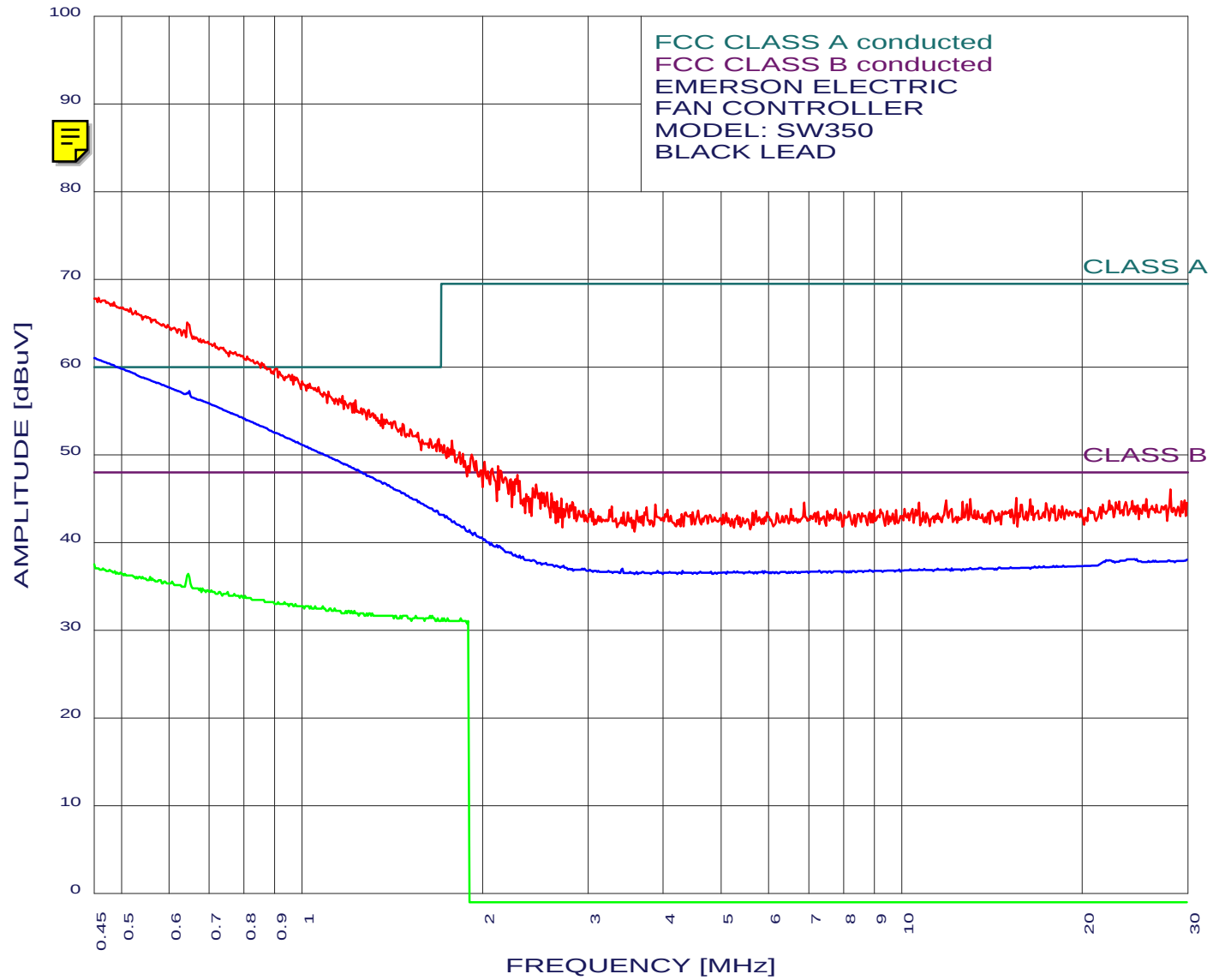
Pol	Freq MHz	Rdng dBuV	Cable loss dB	Ant factor dB	Amp gain dB	Cor'd rdg = R dBuV	limit = L dBuV/m	Delta R-L dB
1H	160.22	42.90	2.00	13.60	38.80	19.70	43.50	-23.80
2H	221.27	43.40	2.20	15.49	38.83	22.26	46.00	-23.74
3H	255.67	38.10	2.57	16.86	38.85	18.68	46.00	-27.32
4H	307.29	41.40	2.83	13.25	38.90	18.58	46.00	-27.42
5H	331.85	42.00	2.93	14.22	38.90	20.25	46.00	-25.75
6H	400.98	41.50	3.30	16.91	38.60	23.11	46.00	-22.89
7H	460.18	40.50	3.26	16.80	38.54	22.02	46.00	-23.98
8H	522.95	45.00	3.68	16.64	38.56	26.76	46.00	-19.24

Test location: Compatible Electronics
Customer : EMERSON ELECTRIC Date : 5/24/2001
Manufacturer : EMERSON ELECTRIC Time : 7.57
EUT name : FAN CONTROLLER Model: SW350
Specification: Fcc_B Test distance: 3.0 mtrs Lab: D
Distance correction factor($20 \cdot \log(\text{test}/\text{spec})$) : 0.00
Test Mode : SPURIOUS EMISSIONS FROM THE EUT
VERTICAL AND HORIZONTAL POLAR. 10 kHz TO 30 MHz
TEMPERATURE 62 DEGREES F., RELATIVE HUMIDITY 95%
TESTED BY: KYLE FUJIMOTO

NO EMISSIONS FOUND FROM 10 kHz TO 30 MHz IN EITHER POLARIZATION
FOR THE EUT

EMISSION LEVEL [dBuV] PEAK
Graph for Peak Quasi-Peak & Average

5/24/2001 12:54:26





5/24/2001 12:54:26

EMERSON ELECTRIC
FAN CONTROLLER
MODEL: SW350
FCC CLASS B - BLACK LEAD
TEST ENGINEER : KYLE FUJIMOTO

34 highest peaks above -50.00 dB of CLASS B limit line

Peak criteria : 0.20 dB, Curve : Peak

Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	0.458	67.89	48.00	19.89*
2	0.470	67.59	48.00	19.59*
3	0.485	67.39	48.00	19.39*
4	0.517	66.69	48.00	18.69*
5	0.528	66.39	48.00	18.39*
6	0.549	65.79	48.00	17.79*
7	0.570	65.39	48.00	17.39*
8	0.643	65.09	48.00	17.09*
9	0.587	64.89	48.00	16.89*
10	0.597	64.79	48.00	16.79*
11	0.612	64.49	48.00	16.49*
12	0.625	64.29	48.00	16.29*
13	0.635	64.19	48.00	16.19*
14	0.660	63.49	48.00	15.49*
15	0.666	63.39	48.00	15.39*
16	0.677	63.19	48.00	15.19*
17	0.685	63.09	48.00	15.09*
18	0.715	62.69	48.00	14.69*
19	0.739	62.19	48.00	14.19*
20	0.758	61.79	48.00	13.79*
21	0.774	61.69	48.00	13.69*
22	0.810	61.20	48.00	13.20*
23	0.842	60.60	48.00	12.60*
24	0.856	60.50	48.00	12.50*
25	0.908	59.80	48.00	11.80*
26	0.916	59.50	48.00	11.50*
27	0.893	59.50	48.00	11.50*
28	0.963	59.10	48.00	11.10*
29	0.951	59.10	48.00	11.10*
30	0.971	58.90	48.00	10.90*
31	0.979	58.80	48.00	10.80*
32	1.000	58.40	48.00	10.40*
33	1.030	58.10	48.00	10.10*
34	1.021	58.00	48.00	10.00*

* Please see the Quasi-Peak Readings on the Next Page and on the Plot



5/24/2001 12:54:26

EMERSON ELECTRIC
FAN CONTROLLER
MODEL: SW350
FCC CLASS B - BLACK LEAD
TEST ENGINEER : KYLE FUJIMOTO

33 highest peaks above -50.00 dB of SECTION 15.207 (b) limit line

Peak criteria : 0.00 dB, Curve : Quasi-peak

Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)	
1	0.462	60.75	61.00	-0.25* **	
2	0.492	60.02	61.00	-0.98*	**
3	0.526	59.26	61.00	-1.74* **	
4	0.549	58.70	61.00	-2.30* **	
5	0.574	58.20	61.00	-2.80* **	
6	0.587	57.95	61.00	-3.05* **	
7	0.599	57.70	61.00	-3.30* **	
8	0.617	57.37	61.00	-3.63* **	
9	0.649	57.25	61.00	-3.75* **	
10	0.622	57.25	61.00	-3.75* **	
11	0.643	57.05	61.00	-3.95* **	
12	0.638	56.93	61.00	-4.07* **	
13	0.677	56.27	61.00	-4.73* **	
14	0.700	55.88	61.00	-5.12* **	
15	0.712	55.63	61.00	-4.37* **	
16	0.742	55.08	61.00	-5.92* **	
17	0.764	54.72	61.00	-6.28* **	
18	0.791	54.28	61.00	-6.72* **	
19	0.804	54.12	61.00	-6.88* **	
20	0.810	53.97	61.00	-7.03* **	
21	0.835	53.58	61.00	-7.42* **	
22	0.846	53.42	61.00	-7.58* **	
23	0.889	52.74	61.00	-8.26* **	
24	0.904	52.49	61.00	-8.51* **	
25	0.927	52.21	61.00	-8.79* **	
26	0.951	51.86	61.00	-9.14* **	
27	0.971	51.58	61.00	-9.42*	**
28	0.984	51.47	61.00	-9.53* **	
29	1.021	50.92	61.00	-10.08* **	
30	1.030	50.77	61.00	-10.23* **	
31	1.042	50.58	61.00	-10.42* **	
32	1.070	50.28	61.00	-10.72* **	
33	1.102	49.89	61.00	-11.11* **	

* The Spec limit was increased 13 dB instead of lowering the reading by 13 dB

** The Readings were then Avg. to make sure they were 6 dB below QP readings



5/24/2001 12:54:26

EMERSON ELECTRIC
FAN CONTROLLER
MODEL: SW350
FCC CLASS B - BLACK LEAD
TEST ENGINEER : KYLE FUJIMOTO

34 highest peaks above -50.00 dB of CLASS B limit line

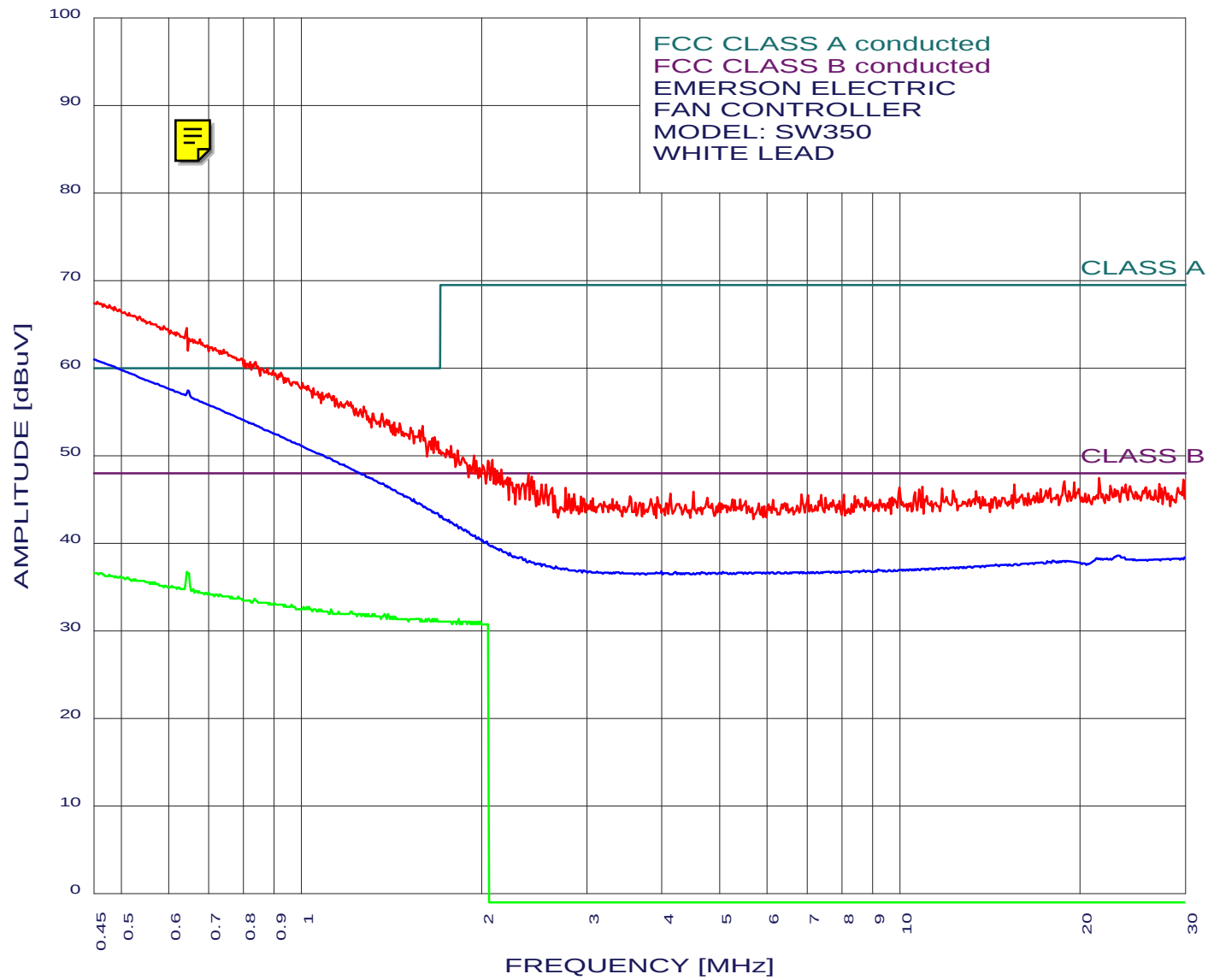
Peak criteria : 0.10 dB, Curve : Average

Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	0.466	37.05	48.00	-10.95*
2	0.478	36.89	48.00	-11.11*
3	0.487	36.73	48.00	-11.27*
4	0.498	36.57	48.00	-11.43*
5	0.492	36.57	48.00	-11.43*
6	0.646	36.41	48.00	-11.59*
7	0.507	36.41	48.00	-11.59*
8	0.558	36.07	48.00	-11.93*
9	0.542	36.07	48.00	-11.93*
10	0.537	36.07	48.00	-11.93*
11	0.530	36.07	48.00	-11.93*
12	0.563	35.89	48.00	-12.11*
13	0.581	35.71	48.00	-12.29*
14	0.607	35.53	48.00	-12.47*
15	0.592	35.53	48.00	-12.47*
16	0.682	34.75	48.00	-13.25*
17	0.677	34.75	48.00	-13.25*
18	0.706	34.55	48.00	-13.45*
19	0.697	34.55	48.00	-13.45*
20	0.751	34.34	48.00	-13.66*
21	0.730	34.34	48.00	-13.66*
22	0.771	34.13	48.00	-13.87*
23	0.804	33.92	48.00	-14.08*
24	0.794	33.91	48.00	-14.09*
25	0.935	33.22	48.00	-14.78*
26	0.912	33.22	48.00	-14.78*
27	0.975	32.98	48.00	-15.02*
28	0.963	32.98	48.00	-15.02*
29	1.083	32.73	48.00	-15.27*
30	1.051	32.73	48.00	-15.27*
31	1.034	32.73	48.00	-15.27*
32	1.026	32.73	48.00	-15.27*
33	1.134	32.47	48.00	-15.53*
34	1.115	32.47	48.00	-15.53*

* These readings are all more than 6 dB below the Quasi-Peak Readings

EMISSION LEVEL [dBuV] PEAK
Graph for Peak Quasi-Peak & Average

5/24/2001 11:49:49





5/24/2001 11:49:49

EMERSON ELECTRIC
FAN CONTROLLER
MODEL: SW345
FCC CLASS B - WHITE LEAD
TEST ENGINEER : KYLE FUJIMOTO

35 highest peaks above -50.00 dB of CLASS B limit line

Peak criteria : 0.20 dB, Curve : Peak

Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	0.456	67.59	48.00	19.59*
2	0.468	67.29	48.00	19.29*
3	0.478	67.19	48.00	19.19*
4	0.487	66.99	48.00	18.99*
5	0.496	66.69	48.00	18.69*
6	0.515	66.29	48.00	18.29*
7	0.537	65.89	48.00	17.89*
8	0.544	65.59	48.00	17.59*
9	0.558	65.29	48.00	17.29*
10	0.589	64.79	48.00	16.79*
11	0.643	64.59	48.00	16.59*
12	0.604	64.29	48.00	16.29*
13	0.620	64.09	48.00	16.09*
14	0.614	64.09	48.00	16.09*
15	0.649	63.39	48.00	15.39*
16	0.677	63.29	48.00	15.29*
17	0.657	63.29	48.00	15.29*
18	0.663	63.19	48.00	15.19*
19	0.682	62.89	48.00	14.89*
20	0.697	62.59	48.00	14.59*
21	0.709	62.39	48.00	14.39*
22	0.718	62.29	48.00	14.29*
23	0.742	62.09	48.00	14.09*
24	0.733	61.99	48.00	13.99*
25	0.794	61.09	48.00	13.09*
26	0.804	60.89	48.00	12.89*
27	0.839	60.70	48.00	12.70*
28	0.821	60.70	48.00	12.70*
29	0.814	60.50	48.00	12.50*
30	0.828	60.40	48.00	12.40*
31	0.846	60.20	48.00	12.20*
32	0.878	60.00	48.00	12.00*
33	0.856	60.00	48.00	12.00*
34	0.897	59.70	48.00	11.70*

* Please see the Quasi-Peak Readings on the Next Page and on the Plot



5/24/2001 11:49:49

EMERSON ELECTRIC
FAN CONTROLLER
MODEL: SW350
FCC CLASS B - WHITE LEAD
TEST ENGINEER : KYLE FUJIMOTO

35 highest peaks above -50.00 dB of SECTION 15.207 (b) limit line

Peak criteria : 0.00 dB, Curve : Quasi-peak

Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)	
1	0.468	60.62	61.00	-0.38*	**
2	0.480	60.34	61.00	-0.66*	**
3	0.487	60.17	61.00	-0.83*	**
4	0.551	58.61	61.00	-2.39*	**
5	0.574	58.20	61.00	-2.80*	**
6	0.609	57.50	61.00	-3.50*	**
7	0.646	57.45	61.00	-3.55*	**
8	0.620	57.28	61.00	-3.72*	**
9	0.666	56.43	61.00	-4.57*	**
10	0.682	56.14	61.00	-4.86*	**
11	0.727	55.35	61.00	-5.65*	**
12	0.821	53.74	61.00	-7.26*	**
13	0.831	53.63	61.00	-7.37*	**
14	0.839	53.49	61.00	-7.51*	**
15	0.856	53.22	61.00	-7.78*	**
16	0.874	52.91	61.00	-8.09*	**
17	0.927	52.15	61.00	-8.85*	**
18	0.935	52.06	61.00	-8.94*	**
19	0.975	51.49	61.00	-9.51*	**
20	0.992	51.31	61.00	-9.69*	**
21	1.070	50.25	61.00	-10.75*	**
22	1.083	50.10	61.00	-10.90*	**
23	1.115	49.73	61.00	-11.27*	**
24	1.163	49.03	61.00	-11.97*	**
25	1.178	48.97	61.00	-12.03*	**
26	1.238	48.16	61.00	-12.84*	**
27	1.249	48.06	61.00	-12.94*	**
28	1.276	47.83	61.00	-12.83*	**
29	1.287	47.59	61.00	-12.59*	**
30	1.298	47.52	61.00	-13.48*	**
31	1.314	47.38	61.00	-13.62*	**
32	1.353	46.87	61.00	-14.13*	**
33	1.370	46.83	61.00	-14.17*	**

* The Spec limit was increased 13 dB instead of lowering the reading by 13 dB

** The Readings were then Avg. to make sure they were 6 dB below QP readings



5/24/2001 11:49:49

EMERSON ELECTRIC
FAN CONTROLLER
MODEL: SW350
FCC CLASS B - WHITE LEAD
TEST ENGINEER : KYLE FUJIMOTO

34 highest peaks above -50.00 dB of CLASS B limit line

Peak criteria : 0.10 dB, Curve : Average

Peak#	Freq(MHz)	Amp(dBuV)	Limit(dB)	Delta(dB)
1	0.643	36.73	48.00	-11.27*
2	0.464	36.57	48.00	-11.43*
3	0.478	36.41	48.00	-11.59*
4	0.498	36.24	48.00	-11.76*
5	0.489	36.24	48.00	-11.76*
6	0.513	36.07	48.00	-11.93*
7	0.528	35.89	48.00	-12.11*
8	0.524	35.89	48.00	-12.11*
9	0.570	35.53	48.00	-12.47*
10	0.565	35.53	48.00	-12.47*
11	0.560	35.53	48.00	-12.47*
12	0.607	35.15	48.00	-12.85*
13	0.594	35.15	48.00	-12.85*
14	0.625	34.96	48.00	-13.04*
15	0.660	34.75	48.00	-13.25*
16	0.674	34.55	48.00	-13.45*
17	0.668	34.55	48.00	-13.45*
18	0.700	34.34	48.00	-13.66*
19	0.694	34.34	48.00	-13.66*
20	0.733	34.13	48.00	-13.87*
21	0.724	34.13	48.00	-13.87*
22	0.784	33.91	48.00	-14.09*
23	0.764	33.91	48.00	-14.09*
24	0.835	33.69	48.00	-14.31*
25	0.900	33.22	48.00	-14.78*
26	0.885	33.22	48.00	-14.78*
27	0.963	32.98	48.00	-15.02*
28	0.939	32.98	48.00	-15.02*
29	1.030	32.73	48.00	-15.27*
30	1.021	32.73	48.00	-15.27*
31	1.009	32.73	48.00	-15.27*
32	1.120	32.47	48.00	-15.53*
33	1.079	32.47	48.00	-15.53*
34	1.070	32.47	48.00	-15.53*

* These readings are all more than 6 dB below the Quasi-Peak Readings

-20 dB BANDWIDTH OF FUNDAMENTAL
REF 100.0 dB μ V ATTEN 10 dB

MKR Δ 254 kHz
-0.20 dB

hp
10 dB/

DL
67.1
dB μ V

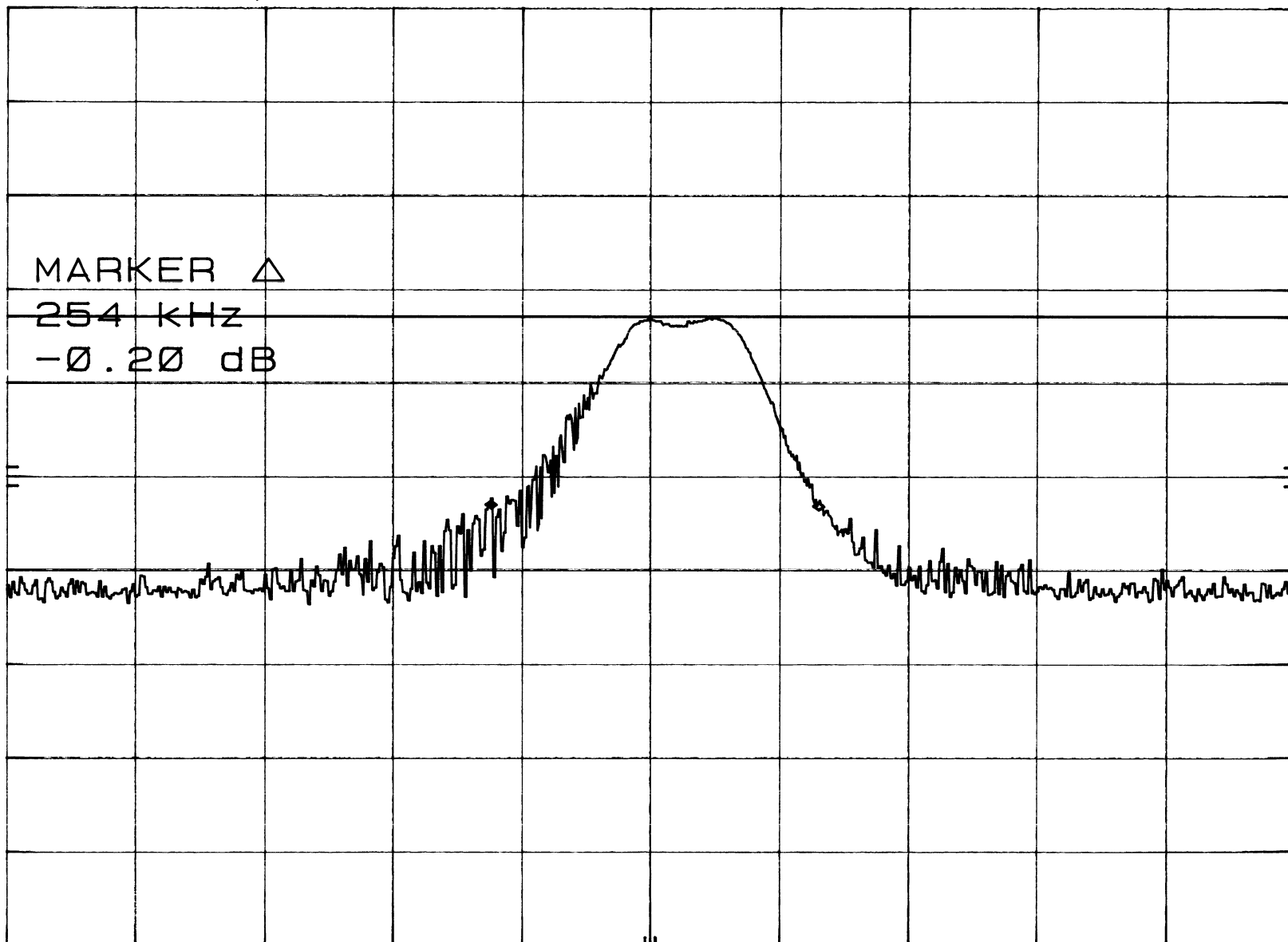
MARKER Δ
254 kHz
-0.20 dB

CORR'D

CENTER 417.56 MHz
RES BW 1 MHz

VBW 1 MHz

SPAN 1.00 MHz
SWP 20.0 msec



APPENDIX E

LABORATORY RECOGNITIONS

LABORATORY RECOGNITIONS

Compatible Electronics has the following agency accreditations:

National Voluntary Laboratory Accreditation Program - Lab Code: 200063-0

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

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

Federal Communications Commission

Industry Canada

Radio-Frequency Technologies (Competent Body)

Technology International (Europe) Ltd.

