

TESTING INSTRUMENTATION AND EQUIPMENT LIST

SPECTRUM ANALYZERS:

H.P.	HP8562A	1KHz to 22GHz	
	S/N 2913A03742	Calibrated	04/06
		Due	04/07

ANTENNAS:

(2)	Ailtech DM105A T1	20-200 MHz	Tuned Dipole
	S/N 93412-105 and 93412-114	Calibrated 3/06	Due: 3/07
(2)	Ailtech DM105A T2	140-400 MHz	Tuned Dipole
	S/N 93413-113 and 93413-117	Calibrated 3/06	Due: 3/07
(2)	Ailtech DM105A T3	400-1000 MHz	Tuned Dipole
	S/N 93413-105 and 93414-111	Calibrated 3/06	Due: 3/07
(2)	AH Systems SAS-200/511	1-12.4 GHz	Log Periodic
	S/N 118 and 124, P/Ns 2069		
(1)	AH Systems SAS-200/540	20-330 MHz	Biconical
	S/N 367 P/N 2052		

INSTRUMENTATION:

H.P.	HP8656B RF Generator	100 KHz - 990 MHz
	S/N A4229590	Calibrated 3/06
		Due 3/07
	Solar Electronics Line Impedance Stabilization Network, Type	
	8012-50-R-24-BNC	Calibrated: 3/06
	S/N 8379585	Due: 3/07
HP 8447D	Broadband preamplifier, 0.1-1300 MHz	
	S/N 2443A03660	Calibrated: 3/06
		Due: 3/07
Mini-Circuits	ZFL-2000 broadband preamplifier, 10-3000 MHz	
	S/N Lin 001	Calibrated: 3/06
		Due: 3/07

ACCESSORIES:

(2)	Ailtech Rulers calibrated in MHz
	4 Meter ABS Antenna Mast and Trolley
	Tektronix C5C Scope Camera
	Eighty Centimeter Tall, Motorized Wooden Turntable
	BNC to BNC Cables - as-required

(2)	25' RG-214/U Low-loss Coaxial Cable
	S/N- LIN001 & LIN002
	Calibrated: 3/06
	Due: 3/07

(2) 3' RG-55/U Low-loss Coaxial Cable, calibrated as part of the preamplifiers.
Automatically taken into account when used with the above itemized range preamplifiers.

**MEASUREMENT OF RADIO FREQUENCY EMISSION
OF CONTROL AND SECURITY ALARM DEVICES
FCC RULES PART 15, C63.4-2003 TEST PROCEDURE**

I. INTRODUCTION

As part of a continuing series of quality control tests to ensure compliance with all applicable Rules and Regulations, this enclosure details the test procedures for certain radio control devices. Testing was performed at a test site located on the property of Linear LLC, 1950 Camino Vida Roble, Suite 150, Carlsbad, California 92008-6517.

II. MEASUREMENT FACILITY DESCRIPTION

The test facility is a specially prepared area adequately combining the desirability of an interference free location with the convenience of nearby 120 volt power outlets, thus completely eliminating the incidence of inverter hash, so often a problem with field measurements.

III. DESCRIPTION OF SUPPORTING STRUCTURES

For Measuring Equipment - The antenna is supported on a trolley that can be raised and lowered on a mast by means of remote control to any level between 1 meter and 4 meters above the ground. For measurements at 3 meters, an antenna height (center of dipole) of about 1 meter generally yields the greatest field strength. For measurements at 1 meter, an antenna height equal to the device under test generally yields the greatest field strength. Usually, horizontal polarization yields the greatest field strength for both 1 and 3 meter measurements.

For Equipment Under Test (EUT): The equipment to be tested is supported by a wooden turntable at a height of eighty centimeters. A two axis swivel at the top of the turntable permits the unit under test to be manually oriented in the position of maximum received signal strength. The turntable can be rotated by remote control.

Test Configuration - All transmitters were located eighty centimeters above ground, at a distance of three meters from the antenna. They were each oriented for maximum radiation by rotating the turntable. The antenna was then moved vertically along the mast for optimum reception in both horizontal and vertical planes. Where no emissions were found, the antenna was also moved to one meter distance to improve system sensitivity.

From 1 GHz to 3 GHz, a Mini-Circuits ZFL-2000 broadband RF preamplifier is used instead of the HP 8447D. In many cases, the antenna is moved in to a distance of 1 meter to enhance test range sensitivity after the 3-meter data is observed. A theoretical 9.54dB improvement is realized. Please see Excel data spreadsheet for details. For a particular device and frequency, the EUT to antenna distance is specified in the Report of Measurements.

Correction of Measured Values - The spectrum analyzer calibration is in units of dBm absolute. Published antenna factor, measured cable loss and preamplifier gain are in units of dB. All equipment is referenced to a 50-ohm characteristic impedance; therefore, any impedance terms will factor out of any calculations. Also, balun loss is included in the antenna factor, so this term will not appear in any calculation.

To obtain field strength, the reference (50 ohm system) $1 \mu\text{V} = 0 \text{ dBuV} = -107 \text{ dBm}$ is used.

For a given frequency: antenna factor, cable loss, preamplifier gain (if used) and a 9.54 dB gain factor (3 meters to 1 meter field strength conversion) when required are factored into the spectrum analyzer reading, resulting in a field strength in units of dBm.

Field strength reading (dBm) + 107 dB = dBuV, using $0 \text{ dBuV} = 1 \mu\text{V}/\text{meter}$ at a specified distance as reference.

All of the equipment was calibrated to NBS-traceable factory specifications prior to the date of measurement.

IV MEASUREMENT PROCEDURE

Transmitters

1. Set the DIP-switch rockers of the transmitter (if needed) to all ON, jam the button in the ON position, and place the transmitter on the test stand.
2. Tune the antenna (if required).
3. Tune the spectrum analyzer.
4. Adjust the antenna height and polarization for peak field strength.
5. Rotate the turntable to orient the transmitter for the highest reading.
6. Record the observed peak emission.
7. Record the screen image (if required).

Spectrum Analyzer Control Settings:

Tuning:	As required
Bandwidth	100 KHz for Field Strength,
Scan Width:	100 KHz/div (may be different when tuning or adjusting display for photographs)
Input Attenuator:	10 dB
Scan Time:	50 mSec. sweep
Reference Level:	0 dBm
Display Mode:	Log 10 dB/division
Video Filter:	OFF
Scan Mode:	Internal
Scan Trigger:	Auto

Receivers

1. Place receiver on test stand, apply power.
2. Tune the antenna to the operating frequency to be measured.
3. Tune the spectrum analyzer.
4. Cohere the Receiver (Superregenerative Receivers Only)

Tune the RF Generator to the center frequency of the superregenerative receiver under test. Apply a signal level of -20 dBm at a distance of approximately two meters. Use an Ailtech antenna of the correct tuned frequency to radiate the cohering signal. Vary the signal frequency to insure that the maximum spurious emissions are recorded.

While radiating a signal, monitor the output levels at the analyzer looking for the largest peak from the unintentional radiator's spurious output.

Record the highest levels near the center frequency but be careful not to record the signal generator as an emission from the receiver.

5. Record the Emission Levels

Retune the antenna to the exact frequency of measurement. Adjust the antenna height and polarization for peak field strength. Rotate the turntable to orient the receiver for maximum emissions and record the frequency and level on the Report of Measurements.

Record an image of spectrum analyzer display for the Report of Measurements, if required.

Spectrum Analyzer Control Settings:

Tuning:	As required
Bandwidth:	100 KHz
Scan Width:	100 KHz/div (may be different when tuning or adjusting display for photographs)
Input Attenuator:	10 dB
Scan Time:	50 msec sweep
IF Mode:	Log 10 dB/division
Reference Level:	-10 dBm
Video Filter:	OFF
Scan Mode:	Internal
Scan Trigger:	Auto

REPORT OF MEASUREMENTS

LINEAR LLC
FCC ID: EF4 SST00113
Model: DXS-73 Smoke Alarm Transmitter

The enclosed documents reflect the requirements contained generally within the code of Federal Regulations, Title 47, Parts 2 and 15 as most recently published October 1, 2005 and all other applicable revisions made by the Commission since that time.

The specific rule sections for which the enclosed documents demonstrate compliance or rely upon to demonstrate compliance with the Commission's application and technical standards are as follows:

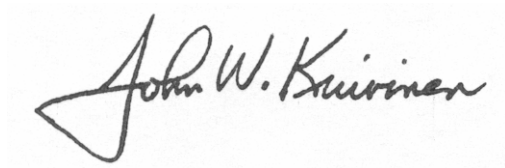
15.201-15.207, 15.231, Subpart C, Intentional Radiators.

Test Procedure C63.4-2003, Section 13, Measurement of Intentional Radiators was used for the testing of this device.

In accord with Section 2.948 of the Commission's Rules, a Test Site submittal is on file with the Commission and a Letter of Acceptance dated March 17, 2006 (Registration Number 90767) is a portion of the Commission's records.

A test site submittal is on file with Industry Canada. The Industry Canada file number is 1078. Dated April, 2006.

All of the information contained within this documentation is true, correct, and complete to the best of my knowledge.



John W. Kuivinen, P.E.
Regulatory Compliance Engineer

_ September 12, 2006 _
Date

DURATION OF RF TRANSMISSIONS

DXS-73

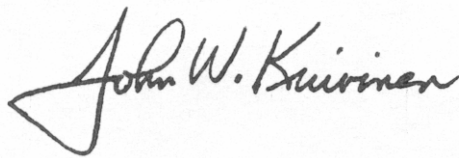
SMOKE ALARM TRANSMITTER

This transmitter is normally automatically activated. It is externally triggered using a locally annunciated smoke alarm. As such, it may be operated continuously by the user (FCC Rules 15.231(a)(4)) during the pendency of the alarm.

When the test push button is pressed, due to battery constraints and an accidental continuous activation causing interference to the system, the maximum length transmission for a single press of the test pushbutton is one second.

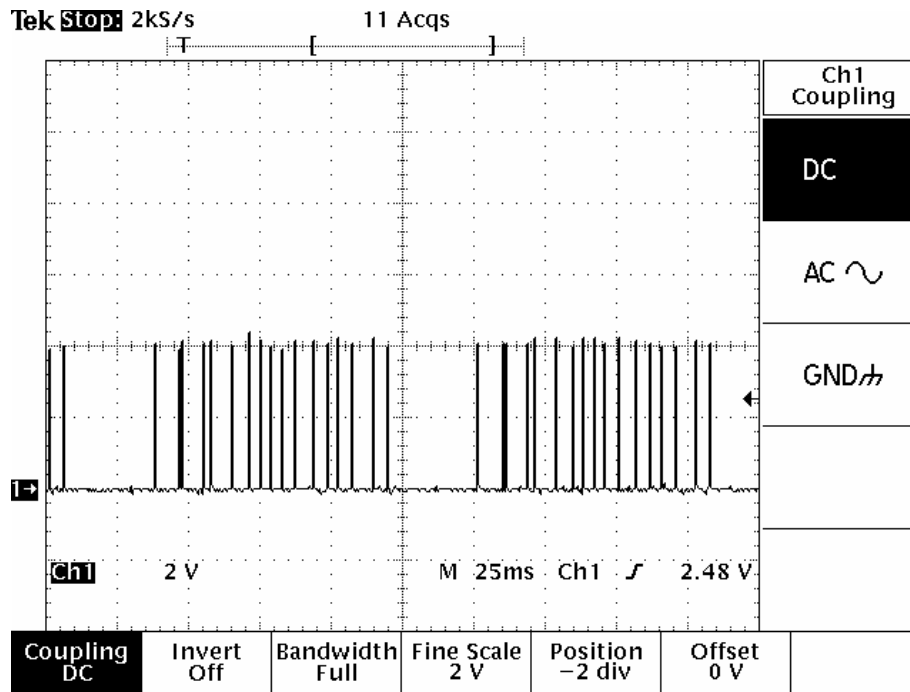
If the test push button is quickly pressed and released, the transmitter will cease transmitting after one second. FCC Rules 15.231 (a)(1) allows no longer than 5 seconds upon the release of a manually activated transmitter.

Signed:

A handwritten signature in black ink that reads "John W. Kuivinen". The signature is written in a cursive style with a large, stylized initial "J".

John W. Kuivinen, P.E.
Regulatory Compliance Engineer

Transmitter Duty Cycle Calculations

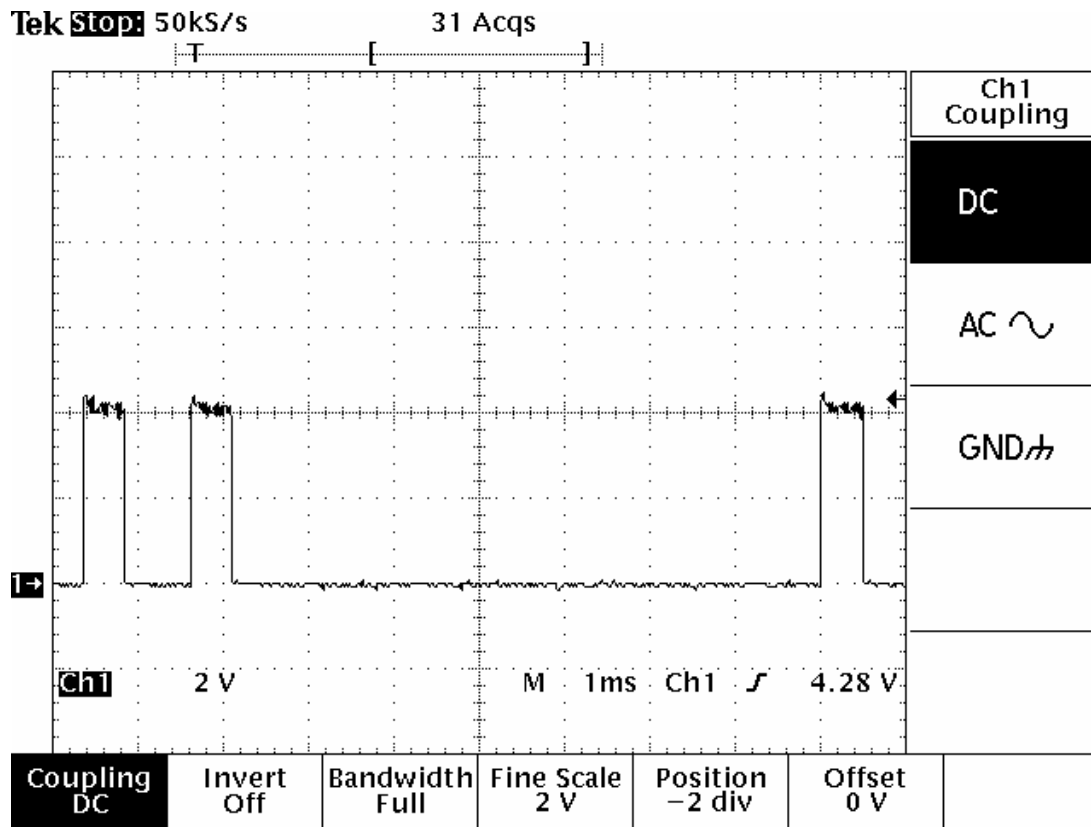


and Time
Domain
Information
DXS Data
Format

17 BITS / DATA WORD + 3 BLANK FRAMES BETWEEN WORDS

DATA WORD = 20 X 5000 USEC = 100 MILLISECONDS FOR NOMINAL
DATA WORD FRAME

TWO DATA WORDS SHOWN ABOVE



INDIVIDUAL DATA PULSES, QUATERNARY ENCODED DATA FORMAT

500 MICRO SECONDS FOR EACH DATA PULSE

TIME DURATION FOR EACH PULSE IS FIXED

3 DATA PULSES SHOWN ABOVE

Transmitter Duty Cycle Calculations and Time Domain Information DX / DXS Data Format

Worst case duty cycle is computed because coded pulse position type A1D modulation is used. Data rate is seventeen 500 uSec pulses in any 100 mSec. time window.

During transmission, the transmitter sequentially emits a group of 17 encoded pulses in the form of a pulse-keyed carrier. The data stream consists of preamble and encoded data string.

REAL TIME ANALYSIS:

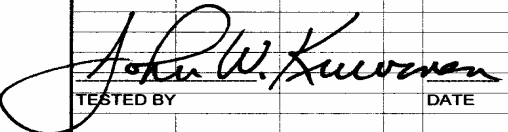
Description	Total Time	"On" Time
Total Transmission	17 x 500 uSec.	= 8.5 E-3 Sec on time

In compliance with FCC Rules 15.35(c), the following duty cycle factor is used for all field strength calculations. A 100 mSec. full word time window is selected with the worst case programmable on time ratio.

$$\frac{8.5 \text{ E-3 On time}}{100 \text{ E-3 Total time}} = 8.5 \text{ E-2 on time per 100 mSec. time window}$$

$$20 \log (8.5\text{E-2}) = -21.4 \text{ dB} \qquad 20 \text{ dB Duty Cycle Ratio (Per FCC Rules)}$$

SECTION 7

REPORT OF MEASUREMENTS																		
Applications for control, security alarm, door opener or remote switch																		
Description:		315.000 MHz transmitter DX format semi-supervised																
DATE:		August 7, 2006																
ITEM TESTED:		Smoke Alarm Transmitter, Sample No. 1, 07D4C0																
MANUFACTURER:		Linear LLC																
TRADE NAME:																		
PRODUCT ID:		EF4 SST00113																
DISTANCE AT WHICH MEASURED:		3 meters, DUT 0.8 meters above ground																
REFERENCE:		15.231																
MEASUREMENT PROCEDURE:		C63.4-2003																
RADIATION																		
A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	Q			
Tuned Frequency MHz	Emission Frequency MHz	Ambient Level dBm	FCC Limit dBm	Meter Reading dBm	UUT & Ant. Pos.**	Antenna Factor dB	Cable Loss dB	Amp Gain dB	Dist Fac dB	Duty Cycle dB	Emission Data			FCC Limit uV/M	dB:FCC	FREQ. MHz		
											dBm/mtr	dBuV/mtr	uV/M					
315.00	315.00	-71.20	-31.18	-34.1	H H	18.6	1.2	0.0	0.00	20.0	-34.30	72.70	4315.19	6042.00	-2.92	315.00		
	630.00	-72.84 *	-49.54 *	-65.4	H H	26.0	1.7	0.0	9.54	20.0	-67.24	39.76	97.27	604.00	-15.86	630.00		
	945.00	-68.94 *	-53.44 *	-63.4	H H	29.4	2.2	0.0	9.54	20.0	-61.34	45.66	191.87	604.00	-9.96	945.00		
	1260.00	-91.54 *	-30.84 *	-41.2	H H	26.8	2.6	20.4	9.54	20.0	-61.74	45.26	183.23	604.00	-10.36	1260.00		
	1575.00	-88.64 *	-33.74 *	-60.1	H H	28.7	3.0	19.8	9.54	20.0	-77.74	29.26	29.04	604.00	-26.36	1575.00		
	1890.00	-86.94 *	-35.44 *	-72.8	H H	30.0	3.3	19.7	9.54	20.0	-88.74	18.26	8.18	604.00	-37.36	1890.00		
	2205.00	-85.14 *	-37.92 *	-62.2	H H	30.8	3.6	18.3	9.54	20.0	-75.64	31.36	36.98	605.00	-24.28	2205.00		
	2520.00	-84.04 *	-43.14 *	-80.9	H H	31.7	3.8	14.2	9.54	20.0	-89.14	17.86	7.82	604.00	-37.76	2520.00		
	2835.00	-82.94 *	-46.94 *	#N/A	H H	32.4	4.2	11.5	9.54	20.0	#N/A	#N/A	#N/A	604.00	#N/A	2835.00		
	3150.00	-82.04 *	-59.34 *	#N/A	H H	33.1	4.4	0.0	9.54	20.0	#N/A	#N/A	#N/A	604.00	#N/A	3150.00		
NOTES:																		
* 1 meter measurement corrected to 3 meters																		
** Device (UUT) and antenna position = H (horizontal) or V (Vertical)																		
The spectrum was searched from 25 to 3500 MHz																		
No other emissions were observed except those shown on this page.																		
15.207 Conducted Emissions Not Applicable- Battery Powered																		
																		
TESTED BY		DATE Sept. 12, 2006																
ENGINEER		DATE																
FILE NAME: SST113_X1.XLS		DISK NAME:		FCC DATA														

SECTION 7

REPORT OF MEASUREMENTS

Applications for control, security alarm, door opener or remote switch

Description: 315.000 MHz transmitter DX format semi-supervised

DATE: August 7, 2006

ITEM TESTED: Smoke Alarm Transmitter, Sample No. 2, 7D4C0

MANUFACTURER: Linear LLC

TRADE NAME:

PRODUCT ID: EF4 SST00113

DISTANCE AT WHICH MEASURED: 3 meters, DUT 0.8 meters above ground

REFERENCE: 15.231

MEASUREMENT PROCEDURE: C63.4-2003

RADIATION

A	B	C		D	E	F	G	H	I	J	K	L	M	N	P	Q	
Tuned Frequency MHz	Emission Frequency MHz	Ambient Level dBm		FCC Limit dBm	Meter Reading dBm	UUT & Ant. Pos.**	Antenna Factor dB	Cable Loss dB	Amp Gain dB	Dist Fac	Duty Cycle dB	Emission Data		FCC Limit uV/M	dB:FCC	FREQ. MHz	
										dB		dBm/mtr	dBuV/mtr	uV/M			
315.00	315.00	-71.20		-31.18	-36.2	H H	18.6	1.2	0.0	0.00	20.0	-36.40	70.60	3388.44	6042.00	-5.02	315.00
	630.00	-72.84	*	-49.54	-66.7	H H	26.0	1.7	0.0	9.54	20.0	-68.54	38.46	83.75	604.00	-17.16	630.00
	945.00	-68.94	*	-53.44	-58.5	H H	29.4	2.2	0.0	9.54	20.0	-56.44	50.56	337.29	604.00	-5.06	945.00
	1260.00	-91.54	*	-30.84	-46.7	H H	26.8	2.6	20.4	9.54	20.0	-67.24	39.76	97.27	604.00	-15.86	1260.00
	1575.00	-88.64	*	-33.74	-57.9	H H	28.7	3.0	19.8	9.54	20.0	-75.54	31.46	37.41	604.00	-24.16	1575.00
	1890.00	-86.94	*	-35.44	-61.8	H H	30.0	3.3	19.7	9.54	20.0	-77.74	29.26	29.04	604.00	-26.36	1890.00
	2205.00	-85.14	*	-37.92	-61.0	H H	30.8	3.6	18.3	9.54	20.0	-74.44	32.56	42.46	605.00	-23.08	2205.00
	2520.00	-84.04	*	-43.14	-67.8	H H	31.7	3.8	14.2	9.54	20.0	-76.04	30.96	35.32	604.00	-24.66	2520.00
	2835.00	-82.94	*	-46.94	#N/A	H H	32.4	4.2	11.5	9.54	20.0	#N/A	#N/A	#N/A	604.00	#N/A	2835.00
	3150.00	-82.04	*	-59.34	#N/A	H H	33.1	4.4	0.0	9.54	20.0	#N/A	#N/A	#N/A	604.00	#N/A	3150.00

NOTES:

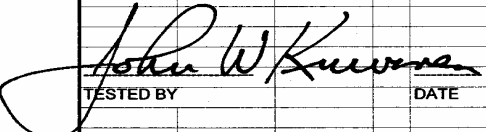
The spectrum was searched from 25 to 3500 MHz

No other emissions were observed except those shown on this page.

* 1 meter measurement corrected to 3 meters

** Device (UUT) and antenna position = H (horizontal) or V (Vertical)

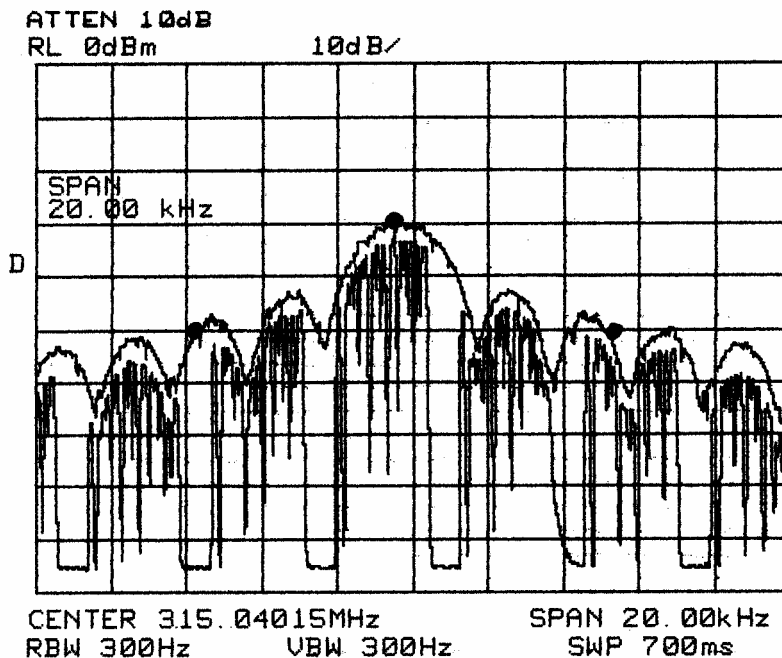
15.207 Conducted Emissions Not Applicable- Battery Powered


 TESTED BY _____ DATE _____

ENGINEER _____ DATE _____

FILE NAME: SST113_X2.XLS

DISK NAME: FCC DATA



DEVICE: DXS-73 Smoke Alarm Transmitter

PHOTOGRAPH: Occupied Bandwidth

CONDITIONS: Transmitter Fundamental. A1D Modulation - Pulse Position Modulation. Fixed Duty Cycle. SAW oscillator frequency determining element.

SPECTRUM ANALYZER CONTROL SETTINGS

CENTER FREQUENCY: 315.04 MHz INPUT ATTENUATION: -10 dB

SCAN WIDTH: 2.0 KHz / Div. PREAMPLIFIER GAIN: 0 dB

SCAN TIME: 70 mSec / Div. LOG REF. LEVEL: 0 dBm

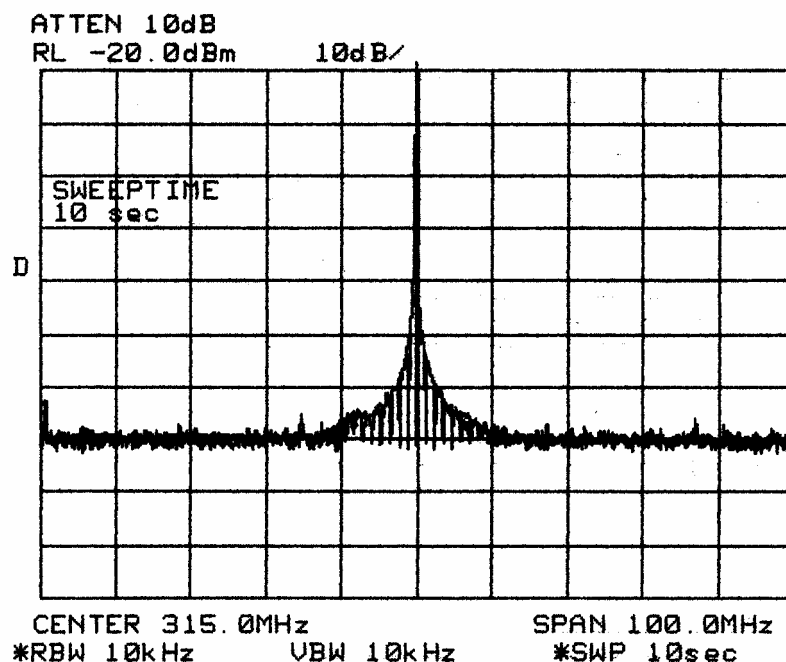
RF BANDWIDTH: 0.3 KHz

ANTENNA: 6" Whip Ant. at Analyzer Input TUNED TO: N/A

ANTENNA DISTANCE: 0.1 Meters ANTENNA HEIGHT: N/A

SYSTEM NOISE FLOOR: N/A

NOTES: Per 15.231(c), Occupied Bandwidth (20 dB down) is less than +/- 8 KHz. This is less than 0.010% of the center frequency. FCC Rules, 15.231(c) devices must be less than 0.25% of center frequency. This device therefore complies with 15.231(c).



DEVICE: DXS-73 Smoke Alarm Transmitter

PHOTOGRAPH: Transmitter Spurious Emissions +/-50 MHz of the tuned center freq. Peak of RF signal set to top of screen.

CONDITIONS: Transmitter Fundamental. A1D Modulation, SAW tuned frequency.

SPECTRUM ANALYZER CONTROL SETTINGS

CENTER FREQUENCY: 315 MHz INPUT ATTENUATION: -10 dB

SCAN WIDTH: 10 MHz/ Div. PREAMPLIFIER GAIN: 0 dB

SCAN TIME: 1.0 Sec. / Div. LOG REF. LEVEL: -20 dBm

RF BANDWIDTH: 10 KHz

ANTENNA: 6" Whip Antenna on Analyzer Input TUNED TO: N/A

ANTENNA DISTANCE: 0.1 Meters ANTENNA HEIGHT: N/A

SYSTEM NOISE FLOOR: N/A

No emissions occur outside of the of the rated center freq. except for harmonic spurious signals.



TEST SETUP, VERTICAL ORIENTATION



TEST SETUP, VERTICAL ORIENTATION



TEST SETUP, HORIZONTAL ORIENTATION



TEST SETUP - HORIZONTAL POSITION