

PCTC

Product Compliance Test Center

2476 Swedesford Road, Malvern, PA 19355

ELECTROMAGNETIC INTERFERENCE TEST REPORT

Doc. 20010915R/Project No. 689

TEST STANDARD - USA CFR 47 PART 15

**STRATA WX
ELECTRONIC ARTICLE SURVEILLANCE DETECTION SYSTEM
FCC ID: DO4STRATAWX**

**CHECKPOINT SYSTEMS, INC.
THOROFARE, NJ**

Test Dates: 5/3/01-8/14/01

Issue: September 21, 2001

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PREFACE

This report documents product testing conducted to verify compliance of the specified EUT with applicable standards and requirements as identified herein. EUT, test instrument configurations, test procedures and recorded data are generally described or attached in the appendices of this report. The reader is referred to the applicable test standards for detailed procedures. The following table summarizes the test results obtained during this evaluation.

SUMMARY

The Checkpoint Systems, Inc., Strata WX as described in Section 2.1, was tested to the standards listed below, and found to have the following characteristics:

TEST	STANDARD	Frequency Range	RESULT
Radiated Emissions Intentional Radiator, Fundamental	FCC Part 15.223	1.705 to 10 MHz	Below Max. Permissible Limit
Radiated Emissions Intentional Radiator, Harmonics	FCC Part 15.209	10 MHz to 1 GHz	Below Max. Permissible Limit
Radiated Emissions Unintentional Radiator (Related to Digital Circuitry)	FCC Part 15.109	30 MHz to 1 GHz	Below Max. Permissible Limit
Conducted Emissions Unintentional & Intentional Radiators	FCC Part 15.207	450 kHz to 30 MHz	Below Max. Permissible Limit

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1.0 Client Information

Client Name: Checkpoint Systems, Inc.
101 Wolf Drive
Thorofare, NJ 08086

Coordinators: Gregory Sleet, David Merva

PCTC Test Personnel: Paul Banker, Ray Rashied

1.1 Requested Service

- Measurement of radio disturbance characteristic of sample product to FCC Part 15.223 for intentional radiators.

1.2 Purpose of Test(s)

The purpose of testing was to verify compliance of the sample EUT to regulatory and/or qualification requirements adhered to by the client for product sale, distribution and use.

2.0 Description of the Equipment Under Test (EUT)**2.1 Equipment Family Description****2.1.1 General**

The Strata WX is an Electronic Article Surveillance System (EAS) designed for outdoor use. The system detects target tags attached to merchandise. The targets resonate in the region of 8.2 MHz. When an article of merchandise is purchased, the target is deactivated which causes it to no longer resonate. The Strata WX system monitors an area 3-feet on either side of the antenna in the 7.6 to 8.7 MHz range, and triggers an alarm when a non-deactivated target is detected.

The Strata WX utilizes the Model 4022 Printed Circuit Board (PCB). Checkpoint Systems, Inc. manufactures several different types of antennae that are used with the 4022 PCB. The Strata WX antenna is constructed of a plastic shell encasing the antenna wires. The TR4022 control module is mounted at the bottom of the antenna.

The overall duty cycle for transmitter operation is 3.84 %.

$(2 \text{ antennae} * 16 \text{ bins} * 2 \text{ blasts per bin} * 6 \text{ } \mu\text{sec/blast}) = 384 \text{ } \mu\text{sec}$

$384 / \text{frame rate } 100 \text{ Hz (10 milliseconds)} = .0384$

2.2 Equipment Sample

2.2.1 Identification

Description:	Electronic Article Surveillance System
Model:	Strata WX with TR4022 Controller and Worldwide 224 Module
Serial Number	none
Manufacturer:	Checkpoint SystemsCheckpoint Systems, Inc, Inc.
Received by PCTC:	3 May 2001
Sample type	Pre-production



Photo 1 – Strata WX

2.2.2 Condition of Received Sample

An evaluation of the Checkpoint, Strata WX was conducted to verify test subject identity and condition and to ensure suitability for testing. No evidence of physical damages was noticed. The test item condition was deemed acceptable for the performance of the requested test services.

3.0 Applicable Requirements, Methods and Procedures

3.1 Applicable Requirements

The results of the measurement of the radio disturbance, fundamental and bandwidth, characteristics of the EUT described herein may be applied, and where appropriate provide a presumption of compliance to one or more of the following regulatory requirements or to other requirement at the discretion of the client, regulatory agencies, or other entities.

3.1.1 USA

47 CFR, Part 15:

Subpart B, Unintentional Radiators

Subpart C, Intentional Radiators
(Including Clause 15.223: Operation in the band 1.705MHz to 10 MHz.)

3.2 Basic Test Methods and Procedures

The applicable regulatory product family or generic standards require that radio disturbance/interference tests be performed in accordance with the following:

- 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”.

Detailed descriptions of the test procedures are provided in Appendix 2 of this report.

4.0 Deviations or Exclusions from the Requirements and Standards

Per customer instructions and agreement with FCC, for measurement of the fundamental and harmonic emissions in the band 1.705 MHz to 10 MHz, a 20 dB reduction from the true peak is to be compared to the limits of 100 μ V/meter (40 dB μ V/meter) at 30 meters. The EUT is to be modulated as normally installed. True peak is the point at which the analyzer bandwidth is adjusted for minimum pulse desensitization. A copy of the correspondence between Checkpoint and FCC is attached in Appendix 4 for reference.

Measurement of the fundamental -- 7.6 to 9.8 MHz -- was performed by setting a spectrum analyzer to “max-hold”, peak detector, a 300 kHz bandwidth, and a span from 6.5 to 10.5 MHz. A resolution bandwidth of 300 kHz was used because increasing the bandwidth above 300 kHz did not increase the detected peak of the fundamental.

5.0 Operation of the EUT During Testing

5.1 Test Environment

5.1.1 Climatic Environment

The following were the ambient conditions in the laboratory during testing:

Temperature: $22^{\circ}\text{C} \pm 1^{\circ}\text{C}$, Relative Humidity: $50\% \text{ RH} \pm 10\%$

5.1.2 Electrical Power

The EUT was operated at electrical power voltages sufficient to ensure that the measured results were representative of operation of the EUT in the power environments in which it would be installed, as specified by the client. Specifically, the EUT was supplied AC power at 120 Vac/60 Hz for all testing described in this report.

5.2 Grounding

AC ground was provided to the power supply through the AC power cord.

5.3 Operating Mode

During testing, the Strata WX was continuously transmitting and monitoring for the presence of a security tag. By design, the EUT is not capable of “standby mode”. A security tag was swept through the field of the Strata WX antenna every 5 seconds to initiate a verification cycle. During this cycle, the Strata WX would indicate the presence of an article tag with an audible alarm. A green LED on the logic module of the unit would light if the tag was detected and red or yellow LED would light if an error occurred.

The TR4022 is a digital swept frequency hopping transmitter. The TR4022 hops on discrete frequencies. The frequencies that can be transmitted by the TR4022 are as follows:

7.600708 MHz	7.673950 MHz	7.747192 MHz	7.820435 MHz
7.893677 MHz	7.966919 MHz	8.040161 MHz	8.113403 MHz
8.186646 MHz	8.259888 MHz	8.333130 MHz	8.406372 MHz
8.479614 MHz	8.552856 MHz	8.626099 MHz	8.699341 MHz

The restricted frequency bands (per FCC Part 15 Clause 15.205) in the operating frequency band of the EUT are as follows:

Frequency (MHz)	8.291 - 8.294	8.362 - 8.366	8.37625 - 8.38675	8.41425 - 8.41475
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The transmitter is not capable of hopping into or operating within the restricted frequency bands.

5.4 Test Configurations

All testing described in this report was performed with the EUT in the equipment configuration shown below. The drawing shows the block diagram of the tested configuration used for the EMI and immunity tests along with AC power distribution. There were no other external interfaces or support equipment attached to the Strata WX.

Ferrite suppression devices are installed at the following locations on the TR4022 Controller:

1. Fair Rite P/N 2865000202 – Add 2 multi-aperture cores each to the TX1, TX2 antenna wires
2. Fair Rite P/N 2865000202 – Add 1 multi-aperture core each to the DC filter wires and speaker wires (3 turns through each side).
3. Fair Rite P/N 2643801502 – Add 1 shield bead to the antenna ground (4 turns through core).
4. Fair Rite P/N 0443806406 – 1 suppression core to DC input cable (3 turns through core).

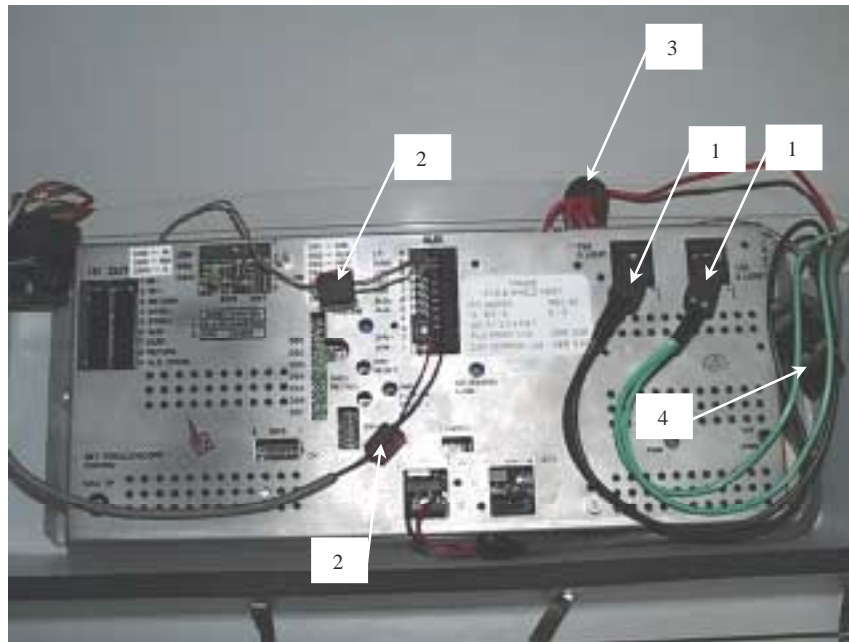


Photo 2 – Ferrite Locations

The output power of the Strata WX is factory set by two potentiometers located on the TR4022. TX1 PWR controls current to the 2-loop and TX2 PWR controls current to the 3-loop. Below are the settings used for this test. The “Pot Position” indicates the pointer of the potentiometer as the hour hand on the face of a conventional clock.

EUT		2-loop (TX1)		3-loop(TX2)	
Model: Strata WX w/4022 PCB		POT POSITION	CURRENT LEVEL	POT POSITION	CURRENT LEVEL
Serial: none	Forward current	4:00	270 mA	4:30	100 mA
	Reverse current	“	“	“	“
Date: 5/2/2001					
Notes: Settings for measurement of fundamental at 30 Meters (FCC)					

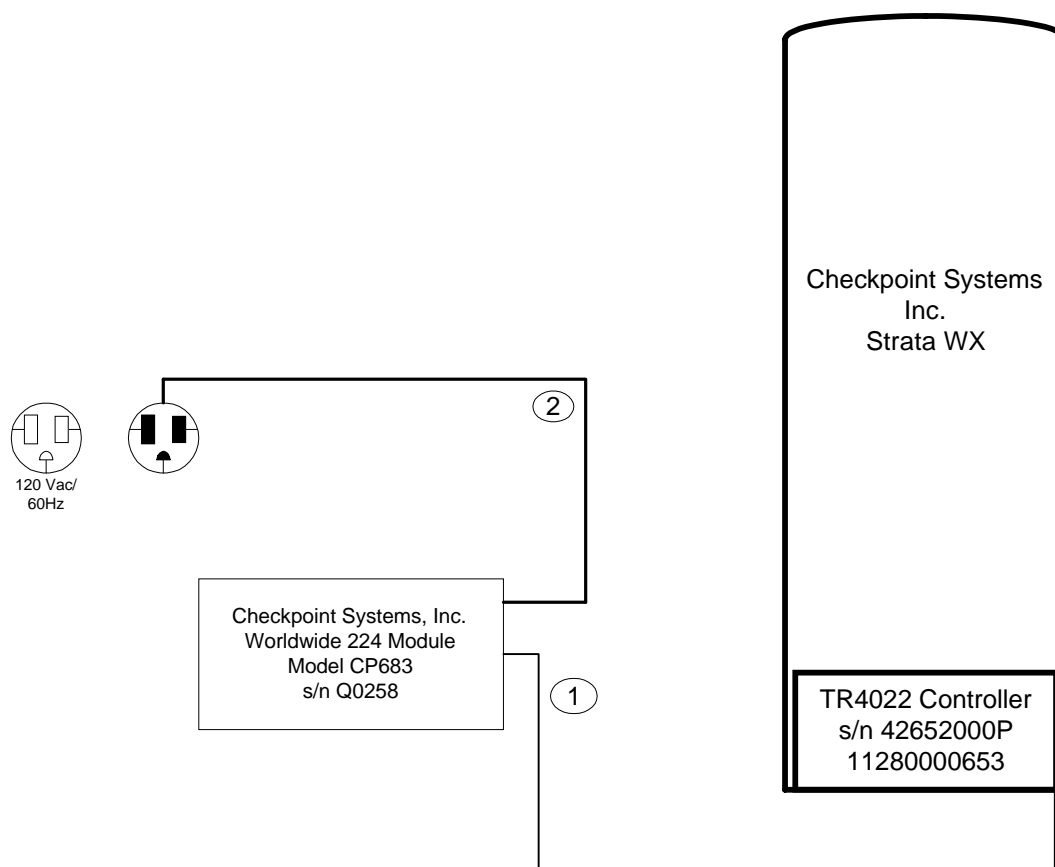


Figure 1 – Block Diagram, EMI Testing of Strata WX

#	Cable Description	Part Number	Manufacturer	Length
1	DC Power cable	-	Checkpoint Systems, Inc	3 Meters
2	AC Line Cord, shielded	IMX 04	Eupen	2 Meters

Table 1 – Cable List of EUT configuration

5.4.1 EUT Details

The following devices were installed in the test field during testing:

Description	Model #	Part #	Manufacturer	Serial #
Antenna/Control Module	Strata WX	-	Checkpoint Systems, Inc.	none
Control module	TR4025 *61	043071	Checkpoint Systems, Inc.	42652000P11 280000653
Power Supply	Worldwide 224 Module	CP683	Checkpoint Systems, Inc.	QT0258

5.4.2 Support Equipment

No equipment was used to support the operation of the Strata WX during testing.

5.5 EUT Modifications

There were no modifications made to the EUT to comply with the standards identified in this report.

6.0 Summary of Test Results

6.1 Emission Tests

6.1.1 Radiated Emission Test (2 May 2001)

Tables 2, 3 and 4 below show the detected field strengths as measured from the EUT(s) over the frequency range from 7.6 MHz to 30 MHz, at a distance of 30 meters using a loop antenna, compared to the maximum permissible FCC limit at 30 meters. All measurements were made with the measuring antenna 1-meter above the ground plane. A description of the procedures used in the performance of this test is provided in Appendix 2.

• **MEASUREMENT OF THE FUNDAMENTAL (Per Section 15.223):**

Table 2 shows the true peak measurement of the fundamental and the comparison of the adjusted true peak to the average limit.

Table 2 – Fundamental E-Field Measurement – True Peak

Freq [MHz]	Height, Pol ¹ [cm 1/2/3]	Angle [Deg]	Peak Detector Voltage [dBuV]	Corr' Factor [dB/m] (2)	Field Strength [dBuV/m]	FCC Average Limit @ 30m [dBuV/m]	Delta Limit [dB]
8.200 Fund*	100,1	180	59.20 Peak	-21.4	37.80	40.00	-2.20

*The true peak signal level of the fundamental was measured using a peak detector as described in section 4.0.

- 1) Polarity of the measuring antenna is 1 - along measuring axis, 2 - along vertical axis, 3 horizontal axis. The reported signal is the highest of the signals measured along each of the axes.
- 2) The correction factor shown represents an antenna factor of -1.4 dB/m and the 20-dB reduction as specified in the measurement procedure.

• **MEASUREMENT RESULT -- AVERAGE**

As indicated earlier, the transmitter operates with a duty cycle of 3.84%. This would result in the following calculations for conversion from peak to average and a subsequent comparison of the fundamental with the average limit.

Table 3 – Calculated Average vs. Average Limit

True Peak:	59.2 dBμV
Pulse Duty Cycle:	3.84%
Correction to Average: 20 * Log ₁₀ (Duty Cycle)	-28.3 dB
Average Level: (True Peak + Correction)	30.9 dBμV
Antenna Correction:	-1.4 dB/m
Corrected Average Field Strength: (Avg Value + C.F)	29.5 dBμV/m
Limit:	40 dBμV/m
Margin with Limit:	-10.5 dB

- **EMISSIONS OUTSIDE THE BAND 1.705 MHz to 10 MHz (Per Section 15.223):**

Table 4 shows the recorded levels of emissions of the harmonics found below 30 MHz specifically, signals outside the frequency range of 1.705 MHz to 10 MHz.

Table 4 – E-Field Emissions (< 1.705 MHz and > 10 MHz)

Freq [MHz]	Height, Pol ¹ [cm 1/2/3]	Angle [Deg]	Quasi-Peak Voltage [dBuV]	Corr' Factor [dB/m]	Field Strength [dBuV/m]	FCC QP Limit @ 30m [dBuV/m]	Delta Limit [dB]
16.40	100,1	180	16.2	-0.67	15.53	40	-24.47
24.60	100,1	180	15.5	1.08	16.58	40	-23.42

1) Polarity of the measuring antenna is 1 - along measuring axis, 2 - along vertical axis, 3 horizontal axis.

- **E-FIELD EMISSIONS 30 MHz to 1000 MHz (Per Section 15.209)**

Table 5 below shows the detected field strengths as measured from the EUT(s) over the frequency range from 30 MHz to 1000 MHz, at a distance of 3 meters compared to the maximum permissible FCC limit at 3 meters. A description of the procedures used in the performance of this test is provided in Appendix 2.

Table 5 – E-Field Emissions (30 MHz to 1000 MHz)

Freq [MHz]	Height, Pol [cm H/V]	Angle [Deg]	Quasi-Peak Voltage [dBuV]	Corr' Factor [dB/m]	Field Strength [dBuV/m]	FCC QP Class B Limit @ 3m [dBuV/m]	Delta Limit [dB]	Result
140.776*	400,V	029	8.1	11.2	19.3	43.52	-24.2	Below limit
240.132*	400,V	289	-0.8	15.1	14.3	46.02	-31.7	Below limit
660.000	100,V	277	15.8	23.4	39.2	46.02	-6.8	Below limit
816.777*	400,H	061	-2.2	25.5	23.3	46.02	-22.7	Below limit
888.265*	400,H	300	0.1	26.6	26.7	46.02	-19.3	Below limit
999.990	184,H	001	9.3	27.7	37.0	53.96	-17.0	Below limit

* Ambient noise floor signals

- Overall Result: All measured radiated emissions from the Strata WX are below the FCC 15.223 and 15.209 limits by a margin of at least 6.8 dB.

• **DIGITAL CIRCUITRY RELATED SIGNALS 30 TO 1000 MHZ – FCC 15.109B**

Table 6 below shows the detected field strengths as measured from the EUT over the frequency range from 30 MHz to 1000 MHz, at a distance of 10 meters compared to the maximum permissible FCC Class A limit. A description of the procedures used in the performance of this test is provided in Appendix 2.

Table 6 – E-Field Emissions Related to Digital Circuitry

Freq [MHz]	Height, Pol [cm H/V]	Angle [Deg]	Quasi-Peak Voltage [dBuV]	Corr' Factor [dB/m]	Field Strength [dBuV/m]	FCC QP Class A Limit @ 10m [dBuV/m]	Delta Limit [dB]	Result
180.556*	400,H	000	4.9	11.7	16.6	43.5	-26.9	Below limit
259.821*	400,H	000	-0.2	15.9	15.7	46.4	-30.7	Below limit
599.989	400,H	312	12.3	22.3	34.6	46.4	-11.8	Below limit
660.001	100,V	319	6.9	23.4	30.3	46.4	-16.1	Below limit
888.590	375,H	176	0.4	26.6	27.0	46.4	-19.4	Below limit
999.998	100,V	056	1.5	27.7	29.2	49.5	-20.3	Below limit

* Ambient noise floor signals

- Overall Result: All measured radiated emissions from the Strata WX are below the FCC Class A limits by a margin of at least 11.8 dB.



Photo 3 -- Strata WX Radiated Emissions Test Setup – Rear View



Photo 4 -- Strata WX Radiated Emissions Test Setup – Front View

6.1.2 Bandwidth Measurement (4 May 2001)

A plot of the operating bandwidth was taken on the operating Strata WX by placing the measuring antenna close to the EUT, setting a spectrum analyzer to 10 dB/div, RBW=VBW=100 kHz, span = 7.0 to 9.0 MHz, Peak detection, max hold. This plot is shown below.

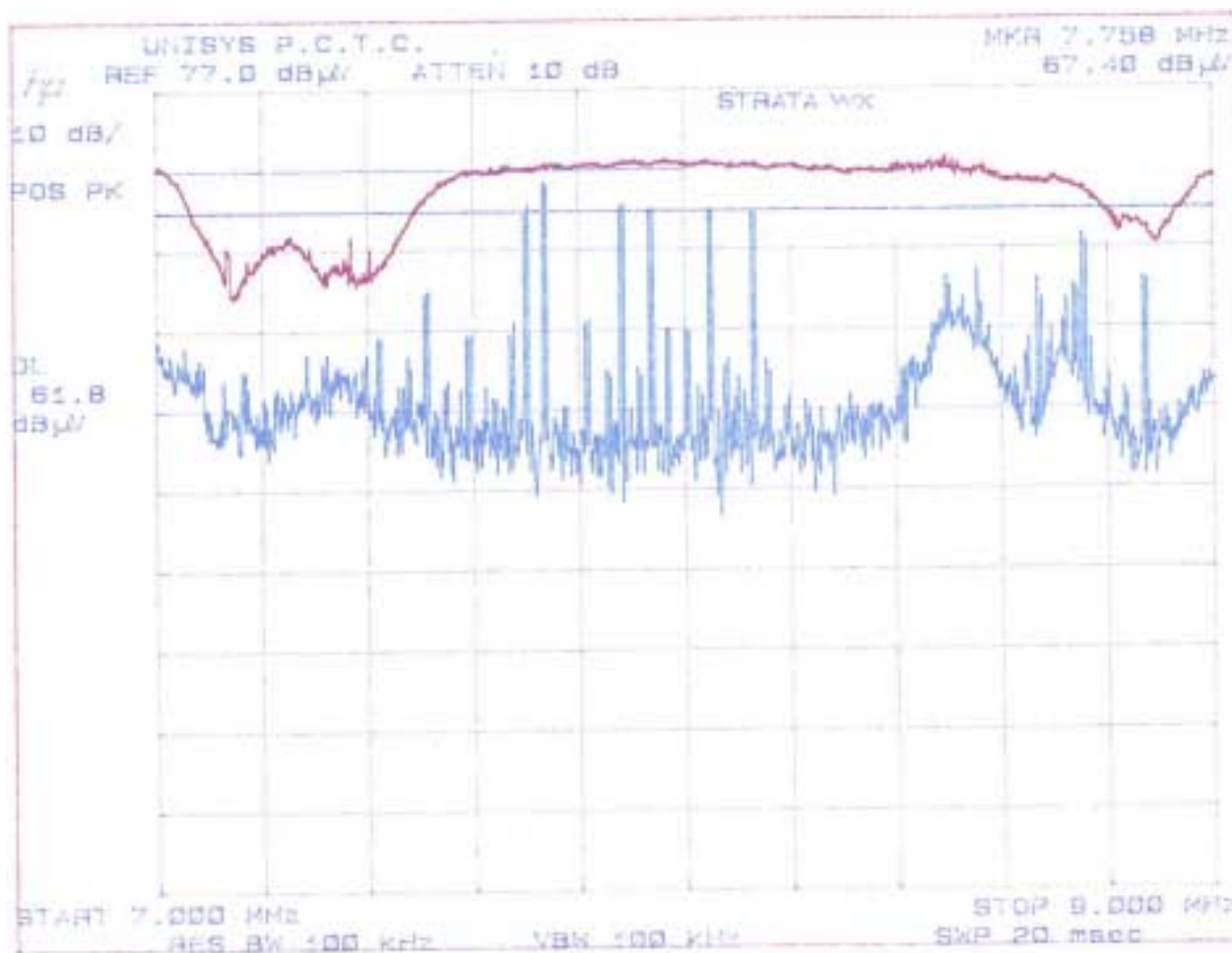


Photo 5 – Bandwidth Plot

The plot above confirms the transmitter bandwidth is 1.2 MHz as stated by the manufacturer. The bandwidth is 14.6% of the fundamental (1.2 MHz / 8.2 MHz) and therefore, per FCC Section 15.223, the limit of 100 uV/m applies for emissions between 1.705 MHz and 10 MHz.

6.1.3 Conducted Emission Test (7 May 2001)

The following tables show the conducted emissions measurement results over the frequency range 450kHz to 30MHz for the EUT for devices operating under 47 CFR part 15C, where the limit of FCC 15.207 applies. The graphs show the emissions captured over the frequency range of 450 kHz to 30 MHz using a peak detector. A description of the procedures used in the performance of this test is provided in Appendix 2. The Worldwide 224 Module, the power supply for the Strata WX, was positioned on an 80-cm table for the measurement of conducted emissions. This position created higher conducted emissions than positioning the power supply on the ground plane. The signals listed in the tables are considered broadband. There was greater than 6-dB difference between quasi-peak and average readings using a 9 kHz bandwidth. 13-dB was subtracted from the quasi-peak readings. This follows the guidelines of 15.207 (b).

- Worldwide 244 Module, Neutral Line 120VAC/60Hz

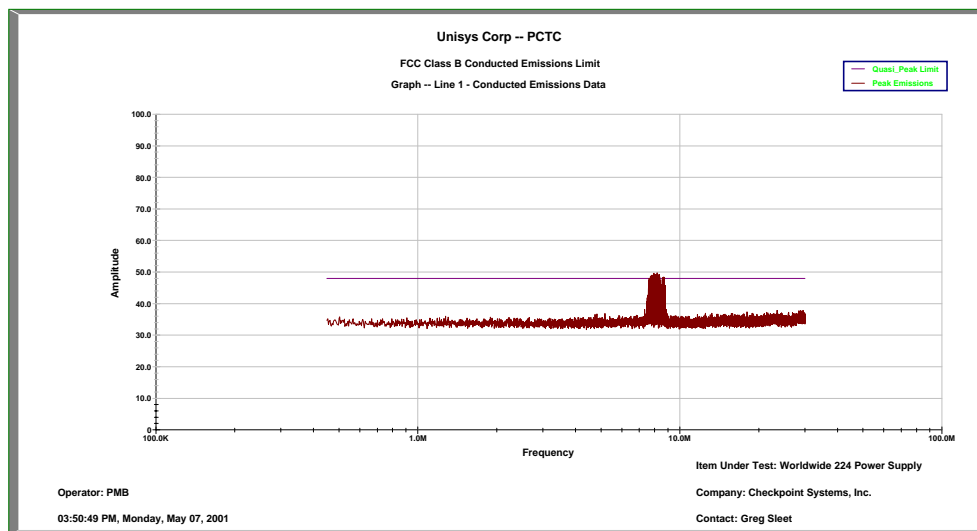


Figure 2 – Graph of AC Wireline Conducted Emissions - Neutral

Table 7 – Conducted Emissions, Neutral Line

Frequency (MHz)	Peak Amplitude (dBuV)	Correction Factor (dB)	Corrected Peak Amplitude (dBuV)	47 CFR Part 15 15.107 Class B Limit (dBuV)	Margin with Limit (dB)	Result
7.81221	18.69	10.502	29.192	47.960	-18.77	Compliant
7.95429	20.31	10.479	30.789	47.960	-17.17	Compliant
8.02874	20.22	10.471	30.691	47.960	-17.27	Compliant
8.10614	19.06	10.480	29.540	47.960	-18.42	Compliant
8.32023	20.35	10.481	30.831	47.960	-17.13	Compliant
8.33926	18.21	10.484	28.694	47.960	-19.27	Compliant

- Worldwide 244 Module, Phase Line 120VAC/60Hz

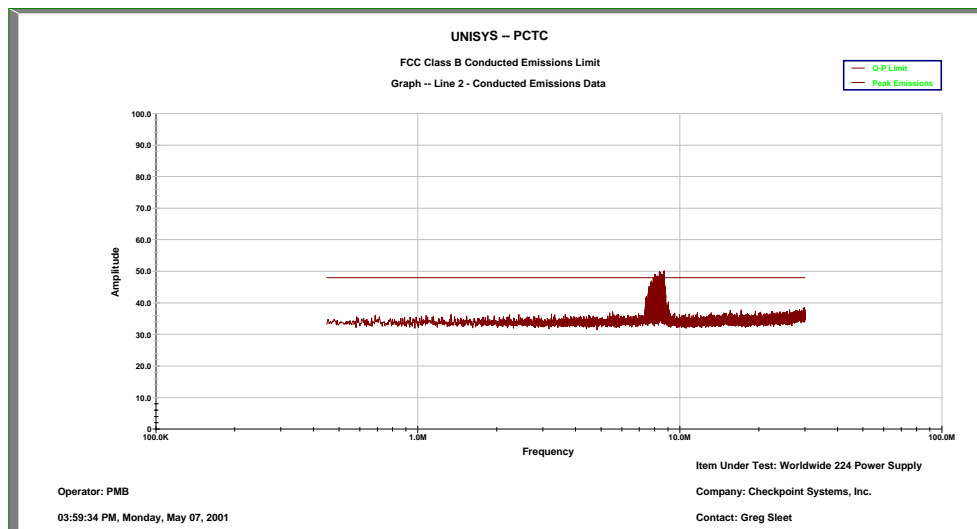


Figure 3 – Graph of AC Wireline Conducted Emissions - Phase

Table 8 – Conducted Emissions, Phase Line

Frequency (MHz)	Peak Amplitude (dBuV)	Correction Factor (dB)	Corrected Peak Amplitude (dBuV)	47 CFR Part 15 15.107 Class B Limit (dBuV)	Margin with Limit (dB)	Result
8.34880	23.50	10.453	33.953	47.960	-14.01	Compliant
8.37778	24.09	10.452	34.542	47.960	-13.42	Compliant
8.39384	23.83	10.452	34.282	47.960	-13.68	Compliant
8.42428	22.98	10.456	33.436	47.960	-14.52	Compliant
8.68637	23.02	10.416	33.436	47.960	-14.52	Compliant
8.73208	22.98	10.415	33.395	47.960	-14.57	Compliant

• Overall Results:

- The Strata WX powered by the Worldwide 224 Module complied with the requirements of FCC 15.207 by a margin of at least 13.42 dB.



Photo 6 – Strata WX Conducted Emissions Test Setup

Appendix 1 – Test Equipment Listing

Radio Disturbance Test Equipment

<u>Equipment</u>	<u>Model</u>	<u>Manufacturer</u>	<u>ID No.</u>	<u>Last Cal Date</u>
QuasiPeak Adapter (10KHz - 1GHz)	85650A	Hewlett Packard	X717	3/30/01
Spectrum Analyzer Display	85662A	Hewlett Packard	U181	3/30/01
Spectrum Analyzer (10KHz – 1.5GHz)	8566B	Hewlett Packard	X718	3/30/01
RF Preselector (20 Hz to 2GHz)	85685A	Hewlett Packard	Y0312	3/30/01
Manual Receiver (9 kHz-30 MHz)	ESH2	Polarad	U964	11/27/00
Manual Receiver (20 MHz -1GHz)	ESV	Polarad	U965	8/3/00
LISN	MN2053	Chase Electric Limited	U776	6/20/00
Loop Antenna (300 Hz – 100 MHz)	BBH- 500/B	ARA	V640	6/22/00
Antenna (25MHz to 2GHz)	LFB-2025	ARA	B-962	1/3/01

Appendix 2 – Description Of Test Facility and Procedures

A.2.0 Description of Test Methods**A.2.1 Emissions Testing****A.2.1.1 Radiated Emissions Test****Test Facilities**

The test site is an all weather, open field measurement facility defined by an elliptical area of 3258 square meters, which is free of reflective metallic objects and extraneous electromagnetic signals. A non-metallic A-Frame enclosure covers 172 square meters of the ellipse. This enclosure contains a ground level 5 meter diameter turntable, capable of rotating equipment through a complete 360 degrees, and a 3 meter and 10 meter test range with remotely controlled antennae masts. The floor of the A-Frame and surface of the turntable are covered with a flat metal continuous ground plane. The ground plane extends outside the A-Frame to a distance of 35.6 meters from the center of the turntable. The width of the extension is 2.4 meters.

The ground plane is partially covered with protective insulating material. A cellar located beneath the ground level of the A-Frame structure houses personnel and instrumentation for remote control of the antennae, the turntable, and other equipment above ground level. The test site complies with the Attenuation Measurements specified in ANSI C63.4 - 1992, and is registered with FCC, and is accredited by AALA, VCCI, and NEMKO.

For electric field radiated emissions, the EUT and support peripherals or devices required to facilitate EUT operation were positioned either directly on the turntable surface or on a wooden table 80 cm. in height, depending on the size of the sample. Hardware not needed in the test field such as remote terminals or non standard exercisers, were placed in the basement below the turntable.

Procedures 9kHz to 30 MHz

Testing below 30 MHz was performed with the EUT configured on the test site as above. A loop antenna was placed at a distance of 30 meters from the EUT, 1-meter above the ground plane. The EUT was rotated 360° in order to obtain a maximum indication on the measuring receiver. This was repeated for each of the three polarizations of the antenna. The position of the antenna relative to the ground plane was noted in the reported data.

Procedures 1.704 MHz to 10 MHz

Testing below 30 MHz was performed with the EUT configured on the test site as above. A loop antenna was placed at a distance of 30 meters from the EUT, 1-meter above the ground plane. The EUT was rotated 360° in order to obtain a maximum indication on the measuring receiver. This was repeated for each of the three polarizations of the antenna.

Per the agreement between Checkpoint and FCC, testing in this frequency range for fundamental emissions, a 20 dB reduction from the true peak was compared with the average limit of 100 µV/meter (40 dBµV/meter) at a measurement distance of 30 meters. The unit under test shall be modulated as normally installed.

True peak was determined by setting the spectrum analyzer with peak detector, to “max-hold” and a frequency span from 6.5 to 10.5 MHz. The resolution bandwidth was increased until no further change was noted in the peak level of the emission. Because of the duty cycle and repetition rate of the pulsed signals, a bandwidth of 300 kHz was found to be sufficient to display the true peak level of the fundamental. This insured that pulse desensitization has been minimized. The peak level was then recorded.

Procedures 30 MHz to 1000 MHz

Initial measurements, for the purpose of identifying suspect emissions from the equipment under test, were performed by dividing the test frequency range into the following twenty bands:

1)	30 - 40 MHz	8)	108 - 148 MHz	15)	570 - 670 MHz
2)	40 - 50 MHz	9)	148 - 165 MHz	16)	670 - 770 MHz
3)	50 - 88 MHz	10)	165 - 200 MHz	17)	770 - 855 MHz
4)	88 - 93 MHz	11)	200 - 300 MHz	18)	855 - 875 MHz
5)	93 - 98 MHz	12)	300 - 450 MHz	19)	875 - 892 MHz
6)	98 - 103 MHz	13)	450 - 470 MHz	20)	892 - 1000 MHz
7)	103 - 108 MHz	14)	470 - 570 MHz		

Each of these bands was monitored on a spectrum analyzer display while the turntable was initially positioned at the reference 0 degree point. A mast mounted broadband antenna was located at a distance of 10 meters from the periphery of the EUT(s). The antenna was set to 1 meter height, for the vertical polarity and 2.5 meters height, for horizontal polarity for these suspect emission scans. All emissions with amplitudes 8 dB or less below the appropriate regulatory limit were identified and saved for later source identification and investigation. This initial suspect identification procedure was repeated for turntable positions of 90, 180 and 270 degrees.

The source of questionable emissions was verified by powering off the EUT(s). Those emissions remaining were removed from the suspect list. Valid suspect emissions were then maximized through cable manipulation. The highest six signals or all within 4 dB of the limit, identified during this initial investigation, were then maximized by rotating the turntable through a complete 360 degrees of azimuth and raising the antenna from 1 to 4 meters of elevation. When the EUT(s) azimuth, antenna height and polarization that produced the maximum indication were found, the emission amplitude and frequency were remeasured to obtain maximum peak and quasi-peak field strength. The frequencies and amplitudes of RFI emissions are recorded in this report in units derived as follows:

$$\begin{aligned}\text{Field Strength (dBuV/m)} = & \text{meter reading (dBuV)} \\ & + \text{antenna factor (dB/m)} \\ & + \text{Cable Loss (dB)}\end{aligned}$$

A.2.1.2 Conducted Emissions Test

Procedure 450 kHz To 30 MHz

Peak amplitude terminal voltage emissions at the power line input to the EUT(s) were measured with a spectrum analyzer, using a peak detector and the appropriate CISPR bandwidth, connected to the RF output of a 50 Ohm, 50 microhenry Line Impedance Stabilization Network (LISN) installed in each power line. Measurements were made over the frequency range from 450 kHz to 30 MHz while the EUT(s) was operating as described in paragraph 5.3.

The significant amplitudes of emissions measured on the AC power lines of the EUT(s) are recorded in this report in units derived as follows:

$$\begin{aligned}\text{Peak Emission (dBuV)} = & \text{meter reading (dBuV)} \\ & + \text{LISN factor (dB)} \\ & + \text{Cable Loss (dB)}\end{aligned}$$

Note: For speed and convenience, a spectrum analyzer employing a peak detector was used as the measuring receiver to sweep through and record the spectrum. As a tool to judge compliance of the emissions, the peak detector sweep is displayed and graphed against the appropriate average limit. This type of measurement is valid given that the peak reading will always be greater than or equal to the average or quasi-peak reading. Peak emissions recorded with the spectrum analyzer that exceed the average limit, or are found to be within 2 dB of the average limit are re-measured using the spectrum analyzer detector function first set to quasi-peak and then to average. These measurements, if necessary, are recorded and printed below each graph.

Appendix 3 – Correspondence Letter

MAR 13 '97 10:59 TO-912105223396
JUL 2W '98 15:19 TO-913013442680

FROM-CHECKPOINT SYSTEMS INC
FROM-CHECKPOINT SYSTEMS INC

T-085 P.02/02 F-071
T-031 P.01/02 F-074



CHECKPOINT SYSTEMS, INC. FACSIMILE TRANSMISSION COVER

To: F.C.C. Lab

Date: 7/26/96

Attention: Mr. Ed Gibbons

Fax No: (609) 344-2366

No. of Pages: 2
(Incl. Cover)

From: Mr. Gregory E. Sleet
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Dear Mr. Gibbons:

Following up on our recent phone conversations, please confirm and if necessary correct our understanding of the points discussed below. Based on the details of our fax dated 7/3/96:

- ✓ • Our pulsed emissions will be treated as frequency hopping, where the bandwidth will be considered the spectrum contained between the lowest and highest carrier frequency we pulse.
- ✓ • A simple ratio of the maximum single restricted band infringed upon divided by the bandwidth of our fundamental emission must be less the 1% to satisfy section 15.205 of the rules.
in the band 1.705-10 MHz
- • For fundamental and harmonic emissions below 30 MHz, a 20 dB reduction from the true peak is to be compared to the limits of 100uV/meter and 30uV/meter respectively at 30 meters. The unit is modulated as normally installed. True peak refers to the point at which the analyzer bandwidth is adjusted for minimum pulse deconvolution.
emissions outside the 1.705-10 MHz band
- • For harmonics above 30 MHz, CISPR quasi-peak measurements will be made with the unit modulating as normally installed. Based on the bandwidth plot, care must be given to measure multiples of the worst case emission points. Limits are as specified in section 15.209.
- ✓ • Conducted emissions remain as specified in part 15 of the rules.

Ed Gibbons
8/2/96