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PCTC
Product Compliance Test Center
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ELECTROMAGNETIC COMPATIBILITY TEST REPORT

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TEST STANDARD - USA CFR 47 PART 15

COUNTERPOINT IX 4/6 MODE & 5 MODE

CHECKPOINT SYSTEMS, INC.
THOROFARE, NJ

Test Date: 10/7/99 To 10/8/99
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AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION

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, Counterpoint IX 4/6 and Counterpoint IX 5 modes, were tested to the standards listed below, and found to have the following characteristics:

TEST	STANDARD	FREQUENCY	RESULT
Radiated Emissions - Intentional Radiator	FCC, Class B Part 15.223	1.705 to 10 MHz	Below Limit Max. Permissible
Radiated Emissions - Unintentional Radiator	FCC, Class B Part 15.209	30 MHz – 1.0 GHz	Below Limit Max. Permissible
Conducted Emissions – Unintentional Radiator	FCC, Class B Part 15.207	450 kHz - 30 MHz	Below Limit Max. Permissible

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1.0 Client Information

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

Coordinator(s): Eric Eckstein, Nimesh Shah

PCTC Test Personnel: Paul Banker

1.1 Requested Service

Measurement of radio disturbance characteristic of sample product to FCC Part 15.223 (Intentional Radiators) and FCC parts 15.207 and 15.209 (Unintentional Radiators).

1.2 Purpose of Test(s)

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

2.0 Description of The Equipment Under Test (EUT)

2.1 General Description

The Counterpoint IX is part of Checkpoint Systems, Inc. EAS (Electronic Article Surveillance) System. The device utilizes RF energy to deactivate security tags attached to merchandise. The Counterpoint IX is used at POS (Point of Sale) locations during purchase. An active tag will be detected by antennae installed at exit and sound an alarm.

The Counterpoint IX sweeps frequencies between 7.6 MHz and 8.7 MHz emitting a narrow six-microsecond pulse. The L/C tuned circuit in the security tags react to the pulse by resonating when exposed the to Counterpoint IX pad antenna. The circuitry of the Mode 5 version of the Counterpoint IX is a subset of the Mode 4/6 version. The Mode 5 contains the same printed circuit board as the Mode 4/6 but has fewer components.

The 4/6 mode of operation, the C/PT IX will alarm when a non-deactivatable tag is placed in its field, but it will not deactivate the tag.

In 5 Mode operation, the C/PT IX V mode will not alarm when a non-deactivatable tag is placed in its field, but will not deactivate the tag.

2.2 Equipment Family Description

The Counterpoint IX is an intentional radiator emitting a narrow pulse radio-frequency signal sweeping between 7.6 and 8.7 MHz. The device must be compliant to Section 15.223 of 47 CFR Code of Federal Regulations.

2.3 Equipment Sample

2.3.1 Identification

A sample of the EUT was tested as follows:

Model No./Name:	Counterpoint IX 4/6 Mode, 5 Mode
Serial Number	Prototypes
Manufacturer:	Checkpoint Systems, Inc.
Received by PCTC:	10/7/99
Sample type	preproduction

2.3.2 Condition of Received Sample

An evaluation of the Checkpoint Systems, Inc. Checkpoint IX 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

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

3.1 USA

47 CFR, part 15, Subpart C, "Intentional Radiators, General Rules and Regulations".

3.2 Basic Test Methods and Procedures

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

- 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”.

4.0 Deviations or Exclusions from the Requirements and Standards

Per customer instructions, measurement of the fundamental, 7.6 to 8.7 MHz, was performed by setting a spectrum analyzer to “max-hold”, peak detector, 300 kHz bandwidth, and a span from 6.5 to 10.5 MHz. This peak detected signal was then compared to the average limit of 15.223 plus 20 dB. This was done due to the pulsed and swept nature of the transmission and in accordance with an agreement with the FCC and Checkpoint Systems, Inc.

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^{o} C ± 5^{o} C
Relative Humidity	32%RH

5.1.2 Electrical Power

During the testing, the Checkpoint IX received input power of single phase 120 VAC/60 Hz.

5.2 Grounding

During EMI testing, earth grounding of the test sample was accomplished through the AC mains input power cord adapter to the Checkpoint IX.

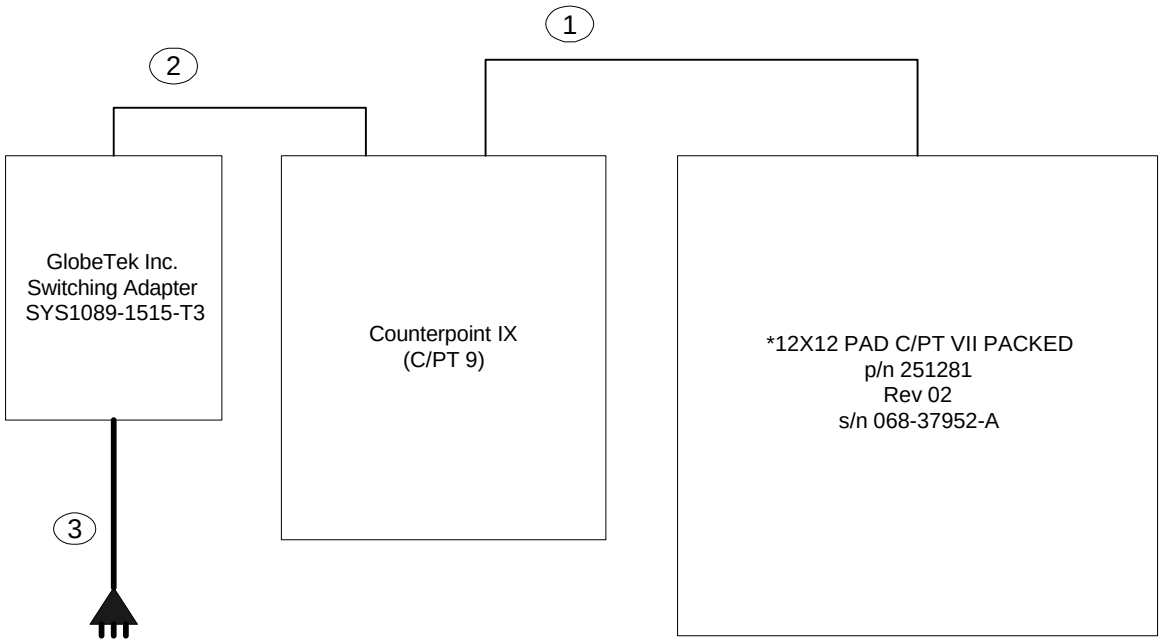
5.3 Operating Mode

The Counterpoint IX mode 4/6 and mode 5 were operated in two conditions, with and without a security tag in the field of the antenna. It was determined that higher signal levels were exhibited without the security tag in the field. All emissions were recorded in this condition. The antenna pad of the Counterpoint IX was laid flat on the wooden table. This is the normal method of antenna installation.

5.4 Test Configurations

Refer to next page for the drawing of EMI test configuration. The drawing shows the physical hardware layout used for the EMI tests along with I/O cables connection and AC power distribution. A description of any external interface cable present during the test is attached to this drawing for reference.

The Counterpoint IX was placed on a wooden table of 80 cm height during EMI testing.



Cable List

1. Pad Cable: 8’ Shielded
2. Low voltage DC: 6’ unshielded
3. AC Line Cord: 6’ unshielded

Figure 1 – Block Diagram, EMI Testing of CounterPoint IX 4/6 Mode & 5 Mode

5.4.1 Support Equipment

The Counterpoint IX required no external support equipment.

5.5 EUT Modifications

There were no modifications needed or added to the EUT during testing.

6.0 Summary Of Test Results

6.1 Radiated Emission Test

6.1.1 Harmonic & Spurious Emissions – 7.6MHz to 30 MHz (10/7/99)

The table below shows 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 compared to the maximum permissible FCC limit at 30 meters. All measurements were made with the measuring antenna on the ground plane. A description of the procedures used in the performance of this test is provided in Appendix 2.

Freq [MHz]	Height(cm), Polarity (1/2/3)*	Angle (Deg)	Q-Peak Voltage [dBuV]	Corr' Factor [dB/m]	Field Strength [dBuV/m]	FCC A Limit @ 30m [dBuV/m]	Delta Limit [dB]	Result
8.107	103, 3	37	23	-1.8	21.2	60.0	-38.8	Below limit
16.200	103, 3	35	17.5	-1.4	16.1	20.0	-3.9	Below limit
24.200	103, 3	30	14.5	1.1	15.6	20.0	-4.4	Below limit

* Polarity of antenna to ground plane: 1 - along measurement axis, 2 – vertical axis, 3 – horizontal axis.

- Results: Harmonic and spurious emissions from the Counterpoint IX are below the FCC 15.223 and 15.209 Class B limits by a margin of at least 3.9 dB.

6.1.2 Digital Device Emissions – 30 MHz – 1000 MHz (10/7/99)

The table below shows the six highest amplitude quasi-peak detected field strengths as measured from the test sample(s) over the frequency range from 30 MHz to 1000 MHz, at a distance of 3 meters compared to the maximum permissible FCC Class B limit at 3 meters. A description of the procedures used in the performance of this test is provided in Appendix 2.

Freq [MHz]	Height(cm), Polarity (H/V)	Angle (Deg)	Q-Peak Voltage [dBuV]	Corr' Factor [dB/m]	Field Strength [dBuV/m]	FCC B Limit @ 3m [dBuV/m]	Delta Limit [dB]	Result
200.443	100, H	227	22.8	12.7	35.5	43.5	-8.0	Below limit
240.537	114, H	321	28.4	12.7	41.1	46.4	-5.3	Below limit
280.619	100, H	201	26.6	14.8	41.4	46.4	-5.0	Below limit
300.699	100, H	359	18	15.8	33.8	46.4	-12.6	Below limit
320.709	145, H	2	11.8	19.2	31.0	46.4	-15.4	Below limit
340.776	100, H	112	14.3	21.6	35.9	46.4	-10.5	Below limit

- Results: Digital devices emissions from the Counterpoint IX are below the FCC 15.223 and 15.209 Class B limits by a margin of at least 5.0 dB.

Photos of the test setup are shown below.

Photo 1 – Photo of EMI Test Setup

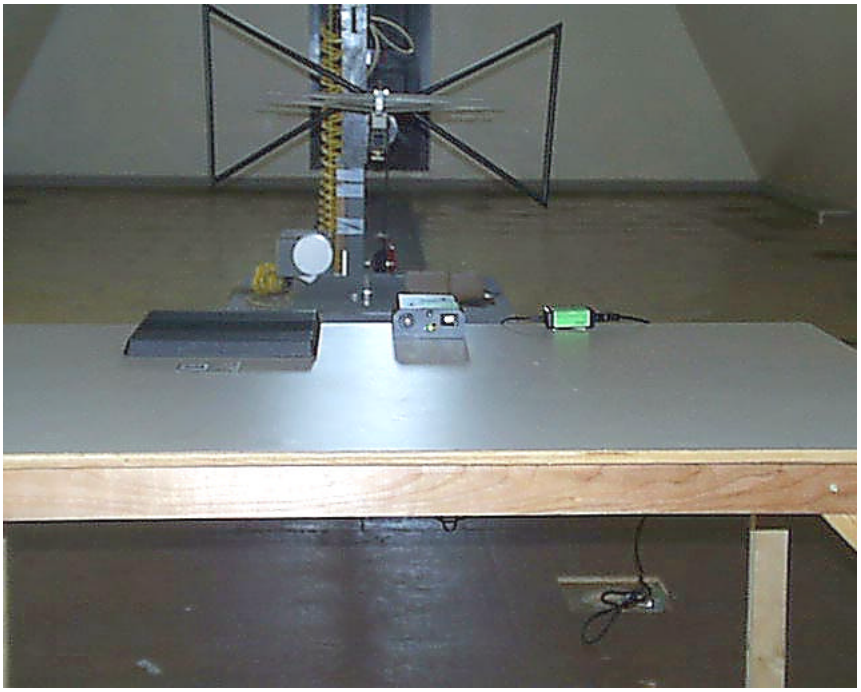


Photo 2 – Photo of EMI Test Setup

6.2 Conducted Emission Test (10/8/99)

The following tables show the conducted emissions measured on the AC power lines of the Counterpoint IX. Compliance testing to the FCC Class B limit was performed on the test sample. A description of the procedures used in the performance of this test is provided in Appendix 2.

Frequency Range (MHz)	FCC Class B limits (dBuV)		Comments
	NB	WB	
0.45 – 30.0	48	61	None

- Counterpoint IX - Phase Line.

Peaks found above 42 dBuV

Freq. (MHz)	Peak Amplitude (dBuV)	Quasi-peak Amplitude (dBuV)	Average Amplitude (dBuV)	Result
3.14	44.2	Not measured	Not measured	Below limit
5.00	42.6	Not measured	Not measured	Below limit
15.89	47.0	Not measured	Not measured	Below limit
15.90	46.0	Not measured	Not measured	Below limit
17.249	54.4	33.3	28.9	Below limit
17.250	53.3	32.7	25.9	Below limit

- Counterpoint IX - Neutral Line.

Peaks found above 41 dBuV

Freq. (MHz)	Peak Amplitude (dBuV)	Quasi-peak Amplitude (dBuV)	Average Amplitude (dBuV)	Result
2.60	40.6	Not measured	Not measured	Below limit
2.61	41.2	Not measured	Not measured	Below limit
2.87	42.2	Not measured	Not measured	Below limit
2.95	41.1	Not measured	Not measured	Below limit
11.6	55.6	34.2	22.3	Below limit
15.8	58.2	31.2	22.1	Below limit

Overall Results: All conducted emissions measured on the AC power lines of the Counterpoint IX are below the FCC Class B limit.

Photo 3 - Photo of Conducted Test Setup

Appendix 1 - Test Equipment Listings

Equipment	Model	Manufacturer	ID No.	Last Cal Date
QuasiPeak Adapter (10KHz - 1GHz)	85650A	Hewlett Packard	X717	2/9/99
QuasiPeak Adapter (10KHz - 1GHz)	85650A	Hewlett Packard	U182	3/12/99
Spectrum Analyzer Display	85662A	Hewlett Packard	X719	3/12/99
Spectrum Analyzer Display	85662A	Hewlett Packard	U181	2/9/99
Spectrum Analyzer (10KHz - 1.5GHz)	8566B	Hewlett Packard	Y0313	2/19/99
Spectrum Analyzer (10KHz - 1.5GHz)	8568B	Hewlett Packard	X718	2/9/99
RF Preselector (20 Hz to 2GHz)	85685A	Hewlett Packard	W927	3/12/99
RF Preselector (20 Hz to 2GHz)	85685A	Hewlett Packard	Y0312	2/9/99
Reciever (9kHz – 30 MHz)	ESV	Polorad	U965	7/15/99
Receiver (20MHz-1 GHz)	ESH2	Polarad	U964	12/28/98
LISN	MN2053	Chase Elec. Ltd.	U775	7/15/99
Antenna (25MHz to 1GHz)	BBH-500/B	ARA	V640	9/24/99
Antenna (25MHz to 2GHz)	LFB-2520	ARA	B-962	6/23/99

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, 30 MHz to 1GHz

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 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. Reference the attached drawing for a view of the test facility. The test site complies with the Attenuation Measurements specified in ANSI C63.4 - 1992, and is registered with FCC, VCCI, NEMKO and EZU.

For electric field radiated emissions, the test sample and support peripherals or devices required to facilitate test sample 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. An H-field measuring antenna was placed at a distance of 30 meters from the EUT at a height of 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: 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 test sample(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 test sample(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 test sample(s) azimuth, antenna height and polarization that produced the maximum indication were found, the emission amplitude and frequency were re-measured 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:

Field Strength (dBuV/m) = meter reading (dBuV)
+ antenna factor (dB/m)
+ Cable Loss (dB)

A.2.1.2 Conducted Emissions Test, 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:

Peak Emission (dBuV) = meter reading (dBuV)
+ LISN factor (dB)

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 an manually tuned receiver with the detector function first set to quasi-peak and then to average. These manual measurements are recorded and provided in Section 6.2 of this report.