ELECTRONICS TEST CENTRE
MPB TECHNOLOGIES INC.

TEST REPORT PREPARED BY:

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Test Report for Emissions Testing of the TELEPath Millenium System with Omnidirectional Antenna
In accordance with FCC Part 15, Subpart C (1995)

Test Personnel:D. Raynes

Prepared for: Critical Control Corp.
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Authorized Signatory

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1.0 INTRODUCTION

1.1 SCOPE

The purpose of this report is to present the results of compliance testing performed in accordance with FCC Part 15, Subpart C.

1.2 APPLICANT

This test report has been prepared for Critical Control Corp., located in Saskatoon, Saskatchewan.

1.3 APPLICABILITY

All test procedures, limits, and results defined in this document apply to the Critical Control Corp. TELEPath unit, referred to herein as the Equipment Under Test (EUT).
The results contained in this report relate only to the items tested.
This report does not imply product endorsement by NVLAP, or the Canadian, or US governments.

1.4 TEST SAMPLE DESCRIPTION

The test sample, provided for testing was a TELEPath Millenium System.

Product Type:	Wireless telephone link
Model Number:	TM2000
Serial Number:	n/a
Power Requirements:	-48 VDC
Peripheral Equipment:	NorTel MilleniumTelephone or RJ11 feed to Central Office Equipment, factory-supplied omnidirectional antenna.
Cables:	1 DC power lead, 1 RJ11 phone plug, 1 factory-supplied RF cable, 4.6 meters long.

More detailed information is supplied by Critical Control Corp. in Appendix A.

1.5 GENERAL TEST CONDITIONS AND ASSUMPTIONS

The EUT was set up and exercised using the configurations, modes of operation and arrangements defined in this report only. All inputs and outputs to and from other equipment associated with the EUT were adequately simulated.

Where relevant, the EUT was only tested using the monitoring methods and test criteria defined in this report.

All testing, unless otherwise noted, was performed under the following environmental conditions:

Temperature:	17 to 23 °C
Humidity:	45 to 75 %
Barometric Pressure:	68 to 106 kPa

1.6 SCOPE OF TESTING

Tests were performed in accordance with FCC Part 15.209 (1995), and ANSI C63.4 (1992).

1.6.1 VARIATIONS IN TEST METHODS

There were no variations from the test procedures outlined above. All measurements were made with the factory-supplied RF cable, which is 4.6 meters long.

1.6.2 TEST SAMPLE MODIFICATIONS

There were no equipment modifications during test performance.

2.0 ABBREVIATIONS

CE -Conducted Emissions

E -Field - Electric Field

H -Field - Magnetic Field

N/T -Not Tested

N/A -Not Applicable

RE -Radiated Emissions

3.0 MEASUREMENT UNCERTAINTY

For Radiated E-Field Emissions and Conducted Emissions, the uncertainties in the measurements were calculated using the methods outlined in the NAMAS document, NIS81: May 1984.

Frequency = ± 1 kHz
Amplitude (RE) = ± 4.01 dB
Amplitude (CE) = ± 3.25 dB

4.0 TEST CONCLUSION

The EUT was subjected to the following tests. Compliance status is indicated as **PASS, Marginal Pass,** or **FAIL**.

The following table summarizes the test results in terms of the specification and class or level applied, the unique test sample identification, and the EUT modification state, the mode of operation, configuration and cable arrangement as applicable.

TEST CASE	TEST TYPE	SPECIFICA-TION	CLASS	TEST SAMPLE	MOD. STATE	CONFIGURATION	RESULT
4.1	Conducted Emissions	Not Applicable	Not Applicable	TELEPath	nil	Simulated Installation	Not Applicable
4.2	Radiated Emissions	FCC Part 15.209	B	TELEPath	nil	Simulated Installation	**PASS**

STATEMENT OF COMPLIANCE

The client equipment referred to in this report was found to comply with the requirements as stated above.

4.1 CONDUCTED EMISSIONS

Test Lab: MPB Technologies Inc. Airdrie Test Personnel: D. Raynes Test Date:	Product: TELEPath Millenium System
Test Result: TELEPath: **Not Applicable**	
Objectives/Criteria	Specifications
The Conducted E-Field emissions proliferated by a system or sub-system shall not exceed the limits for the specifications as stated. **Emission levels should meet the requirements with a margin of 6dB**.	**FCC Part 15 Subpart B** **Frequency** **Class A** **Class B** QP QP 0.450-1.7 MHz 60.0 48.0 1.7-30 MHz 60.0 48.0 Units of measurement are dBµV.
Comments: The EUT was not assessed for Conducted Emissions because there is no direct connection to the AC mains.	

4.2 RADIATED EMISSIONS

Test Lab: MPB Technologies Inc. Airdrie Test Personnel: D. Raynes Test Date: 27 November 2000	Product: TELEPath

Test Result, TELEPath: **PASS/Marginal Pass/FAIL/ Not Applicable**

Objectives/Criteria	Specifications
The Radiated E-Field emissions proliferated by a system or sub-system, measured at a distance of 3m from the EUT, shall not exceed the limits for the specifications as stated. **Emission levels should meet the requirements with a margin of 6dB.** The EUT was assessed against the requirements for **Class B.**	FCC Part 15.209 **Frequency** **Class A** **Class B** @3m @3m 30-80 MHz 49.5 40.0 80-216MHz 54.0 43.5 216-960MHz 57.0 46.0 960MHz & above 60.0 54.0

Comments: There were no more points within 10 dB of the limits specified in Part 15.209. Emissions within the Restricted Bands are unreportable.

Vertical:			**Horizontal:**		
f (MHz)	Field Strength (dBµV/m)	Delta (dB from limit)	f (MHz)	Field Strength (dBµV/m)	Delta (dB from limit)
33.174	31.34	-8.66			

Refer to the test data plots for more detail.


TELEPath with
omnidirectional
antenna
27 November 2000

5.0 TEST FACILITY

5.1 LOCATION

The EUT was tested for Electromagnetic Compatibility at the Electronics Test Centre, located in Airdrie, Alberta, Canada.

The RF Anechoic Chamber (RFAC) is identified as Chamber 1, located in the main building complex at the Electronics Test Centre. Its usable working space measures 10.6 m long x 7.3 m wide x 6.5 m high.

The floor, walls and ceiling consist of annealed steel panels. The walls and ceiling are covered with ferrite tile, augmented by RF absorbant foam material on the end wall nearest the turntable, and on the adjacent walls and the ceiling. The chamber floor supports a 15 cm high internal floor, constructed of annealed steel panels, that forms the ground plane, and is bonded to the chamber walls.

The 3 m diameter turntable is flush-mounted with the floor. A sub-floor cable-way is provided to route cables between the turntable pit and EUT support equipment. EUT access is gained through an opening in the centre of the turntable.

Test instrumentation and EUT support equipment is located in two shielded vestibules located at the side of the main room. Cables are routed through bulkhead panels between the rooms as required. Power feeds are routed into the main room and vestibules through line filters providing at least 100 dB of attenuation between 10 kHz and 10 GHz.

5.2 GROUNDING PLAN

The EUT was located on a wooden table 80 cm above the ground plane. The EUT was grounded according to Critical Control Corp. specifications.

5.3 POWER

AC power was supplied to the test chambeer via an Underwriter's Laboratories ULW100-69, 100 dB, 100 Ampere wall mounted filter. Bonding to ground is via eight inch lengths of two inch steel conduit.

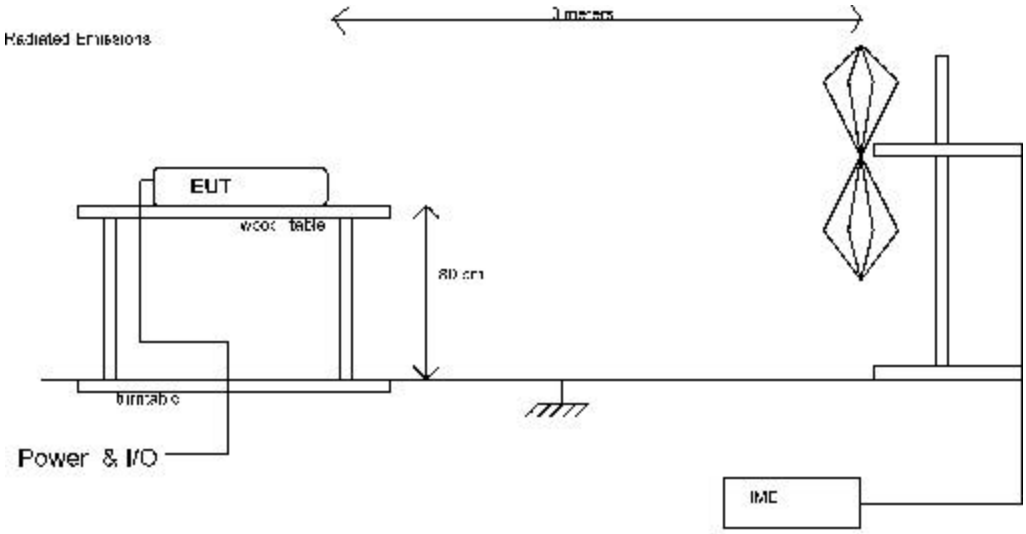
5.4 EMISSIONS PROFILE

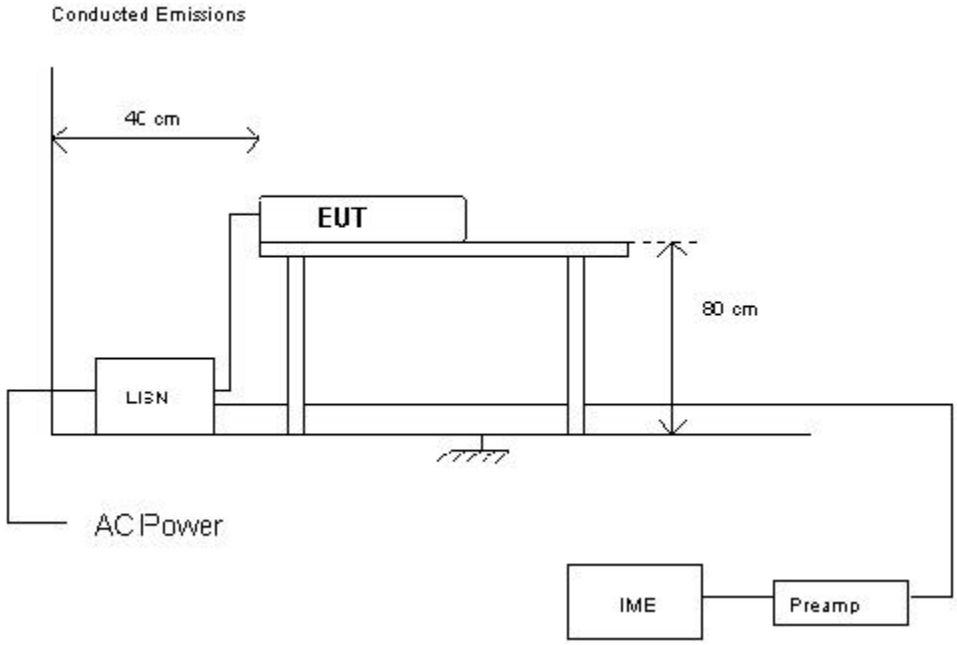
Ambient conducted and radiated electromagnetic emission profiles were generated throughout the tests and are included in the test report data.

5.5 TEST CONFIGURATION

5.5.1 Table Top Equipment

The following diagrams illustrate the configuration of the EUT test and measurement equipment used for FCC Part 15 Radiated and Conducted Emissions Testing.





6.0 TEST EQUIPMENT

The following equipment was used for this procedure. All measurement devices are calibrated annually, traceable to NIST.

6.1 RADIATED EMISSIONS

a) Spectrum Analyzer with RF preselector
b) CISPR Quasi-peak Adapter
c) Power Isolation Transformers
d) Biconilog antenna (20 MHz to 2 GHz)
e) Antenna mast positioner, and controller
f) Flush-mounted turntable, and controller
g) Personal Computer and EMC software

6.2 CONDUCTED EMISSIONS

a) Spectrum Analyzer with RF preselector
b) Line Impedance Stabilization Network, 50 μH
c) CISPR Quasi-peak Adapter
d) Power Isolation Transformer
d) Personal Computer and EMC software

6.3 CALIBRATION

All measurement instrumentation conforms to ANSI C63.2. Calibration is maintained in accordance with manufacturer recommendations, and ISO Guide 25. Each measurement device is labeled with its ETC asset number and calibration due date.

6.3.1 Calibration Accuracy

Test equipment used to provide quantitative measurements are calibrated with standards traceable to the National Research Council, National Institute of Standards and Technology, or other national standards. Instrumentation systems for emissions measurements have the following accuracies:
Frequency: ± 1 kHz
Amplitude: ± 2 %

6.3.2 Test Equipment Description

Instrument	Manufacturer	Model No.	Asset No.	Calibration Status
Spectrum Analyzer	Hewlett Packard	8566B	9565	Annual Calibration
Spectrum Analyzer	Hewlett Packard	8566B	9168	Annual Calibration

Measurement Range: 100 Hz To 22 GHz

Resolution Bandwidth: 3 MHz bandwidths of 10 Hz to 3 MHz in a 1, 3, 10 sequence.
Amplitude Measurement Range: -134 dBm to + 30 dBm

Dynamic Range Spurious Response:

For signals < -40 dBm, all harmonic and intermodulation distortion > 70 dBm below input.

RF Input: 100 Hz to 22 GHz precision female type N connector.

Input SWR: 1.2, 100 Hz to 2.5 GHz; 1.5, 2.5 GHz to 5.8 GHz; 1.9, 5.8 GHz to 22 GHz with 10 dB input attenuation.

Instrument	Manufacturer	Model No.	Asset No.	Calibration Status
RF Preselector	Hewlett Packard	85685A	9563	Annual Calibration
RF Preselector	Hewlett Packard	85685A	9728	Annual Calibration

Measurement Range: 20 Hz to 2 GHz

Displayed Average Noise Level: -115 dBm, 9 KHZ to 50 KHZ; -132 dBm, 50 KHZ to 1 MHz; -150 dBm, 1 MHz to 1500 MHz; -147 dBm, 1500 MHz to 2000 MHz.
Residual Response: -90 dBm, 2 KHZ to 1 MHz; -112 dBm, 1 MHz to 2000 MHz.
RF Input: 20 Hz to 2 GHz precision female type N connector.
Input SWR: < 1.5

Instrument	Manufacturer	Model No.	Asset No.	Calibration Status
Quasi-Peak Adapter	Hewlett Packard	85650A	9243	Annual Calibration

Amplitude Accuracy: Bypass mode, ± 0.3 dB; normal mode, ± 1.0 dB

Frequency Accuracy in Normal Mode: 200 Hz BW, ± 10 Hz; 9 kHz BW, ± 4.5 kHz; 120 kHz BW, ± 60 kHz.

Instrument	Manufacturer	Model No.	Asset No.	Calibration Status
Line Impedance Stabilization Network	EMCO	3825/2r	9331	Annual Inspection
Line Impedance Stabilization Network	EMCO	3825/2r	9259	Annual Inspection

Isolation Frequency Range: 10 kHz to 100 MHz
Power Source Frequencies: 0 Hz to 400 Hz
Current Rating: 25 amps
The 3825/2r LISN is designed to stabilize test units which operate with two line, single phase power.

Instrument	Manufacturer	Model No.	Asset No.	Calibration Status
Biconilog	ARA	Lpb-2520/A	4318	Annual Calibration

Measurement Range: 25 MHz to 2000 MHz
Power Handling Capability: 1000 W

Average VSWR: 2:1

Appendix A

TELEPath

Test Sample Description

(from data suplied by Critical Control Corp.)

Product Application	Product Category
Commercial ✓ Military ☐	Telecommunication ✓ Aerospace ☐ Information Technology ☐ Test & Measurement ☐ Surface Transportation ☐ Other ☐ _____
Product Name	TELEPath Millenium System
Part/Model No.	TM2000
Serial Number	n/a
Power Requirements: (Voltage, AC/DC, Hz, Current)	-48VDC
Internally Generated Frequencies	925.328 MHz, 923.024 MHz, 920.464 MHz, 917.904 MHz, 915.344 MHz, 913.040 MHz, 910.736 MHz, 908.432 MHz,
Peripheral Support Equipment	NorTel Millenium telephone
	Factory-supplied Antenna
	Connection to Central Office equipment
Description and number of interconnecting Leads & Cables	1 DC power connection
	1 RJ11 telephone cable
	1 RF cable
Brief Functional Description	Wireless telephone link