Excellence in Compliance Testing

Certification Test Report

FCC ID: UP3PC6
IC: 2852A-PC6

FCC Rule Part: 15.209
IC Radio Standards Specification: RSS-210

ACS Report Number: 10-0162.W06.11.A

Manufacturer: Lathem Time Corp.
Model: PC600

Test Begin Date: May 12, 2010
Test End Date: July 16, 2010

Report Issue Date: July 16, 2010

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612-0

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Reviewed by:
Kirby Munroe
Director, Wireless Certifications
ACS, Inc.

This report contains 16 pages

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1 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15 Subpart C of the FCC's Code of Federal Regulations and Industry Canada's Radio Standards Specification RSS-210.

1.2 Product description

The PC600 is a Data Collection Terminal to be used in Time & Attendance applications. It is enclosed in ABS Plastic and powered by an external Power Adapter that converts 115vAC Input to low-voltage 12vDC for the Terminal. It is based upon ARM9 processor architecture and its application firmware runs on the Win-CE Operating System.

Technical Details:
Frequency Range: 125 kHz
Operating channels: 1
Modulation: OOK
Operating Voltage: 12 VDC

Manufacturer Information:
Lathem Time Corporation
200 Selig Dr. S.W.
Atlanta GA 30336

Test Sample Serial Number(s): ACS#1

Test Sample Condition: The test samples were provided in good working order with no visible defects.

1.3 Test Methodology and Considerations

The PC600 was tested in a configuration and orientation as typically installed. The alarm terminals were terminated with a representative resistive load.

2 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions
5015 B.U. Bowman Drive
Buford, GA 30518
Phone: (770) 831-8048
Fax: (770) 831-8598

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program (NVLAP), Lab Code 200612-0. Unless otherwise specified, all tests methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

The Semi-Anechoic Chamber Test Site, Open Area Test Site (OATS) and Conducted Emissions Site have been fully described, submitted to, and accepted by the FCC, Industry Canada and the Japanese Voluntary Control Council for Interference by information technology equipment.

FCC Registration Number: 894540
Industry Canada Lab Code: IC 4175A-1
VCCI Member Number: 1831

- VCCI OATS Registration Number R-1526
- VCCI Conducted Emissions Site Registration Number: C-1608

2.3 Radiated Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The Semi-Anechoic Chamber Test Site consists of a 20' x 30' x 18' shielded enclosure. The chamber is lined with Toyo Ferrite Grid Absorber, model number FFG-1000. The ferrite tile grid is 101 x 101 x 19mm thick and weighs approximately 550 grams. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber.

The turntable is 150cm in diameter and is located 160cm from the back wall of the chamber. The chamber is grounded via 1 - 8' copper ground rod, installed at the center of the back wall, it is bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is all steel, flush mounted table installed in an all steel frame. The table is remotely operated from inside the control room located 25' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Behind the turntable is a 3' x 6' x 4' deep shielded pit used for support equipment if necessary. The pit is equipped with 1 - 4" PVC chases from the turntable to the pit that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit.

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3-1 below:

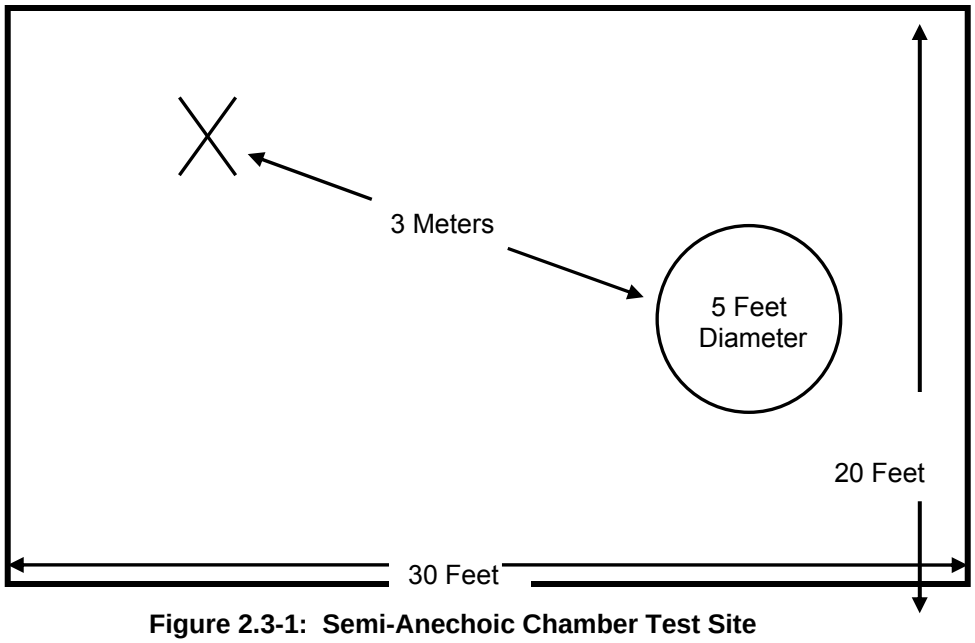


Figure 2.3-1: Semi-Anechoic Chamber Test Site

2.3.2 Open Area Tests Site (OATS)

The open area test site consists of a 40' x 66' concrete pad covered with a perforated electro-plated galvanized sheet metal. The perforations in the sheet metal are 1/8" holes that are staggered every 3/16". The individual sheets are placed to overlap each other by 1/4" and are riveted together to provide a continuous seam. Rivets are spaced every 3" in a 3 x 20 meter perimeter around the antenna mast and EUT area. Rivets in the remaining area are spaced as necessary to properly secure the ground plane and maintain the electrical continuity.

The entire ground plane extends 12' beyond the turntable edge and 16' beyond the antenna mast when set to a 10 meter measurement distance. The ground plane is grounded via 4 - 8' copper ground rods, each installed at a corner of the ground plane and bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is an all aluminum 10' flush mounted table installed in an all aluminum frame. The table is remotely operated from inside the control room located 40' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Adjacent to the turntable is a 7' x 7' square and 4' deep concrete pit used for support equipment if necessary. The pit is equipped with 5 - 4" PVC chases from the pit to the control room that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit. The pit is covered with 2 sheets of 1/4" diamond style re-enforced steel sheets. The sheets are painted to match the perforated steel ground plane; however the underside edges have been masked off to maintain the electrical continuity of the ground plane. All reflecting objects are located outside of the ellipse defined in ANSI C63.4.

A diagram of the Open Area Test Site is shown in Figure 2.3-2 below:

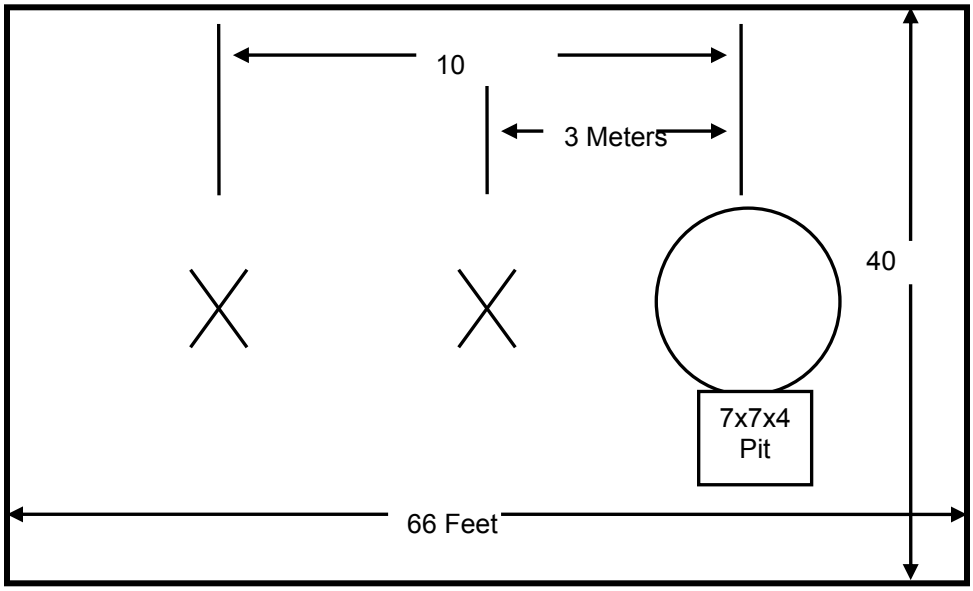


Figure 2.3-2: Open Area Test Site

2.4 Conducted Emissions Test Site Description

The AC mains conducted EMI site is located in the main EMC lab. It consists of an 8' x 8' solid aluminum horizontal group reference plane (GRP) bonded every 3" to an 8' X 8' vertical ground plane.

The site is of sufficient size to test table top and floor standing equipment in accordance with section 6.1.4 of ANSI C63.4.

A diagram of the room is shown below in figure 4.1.3-1:

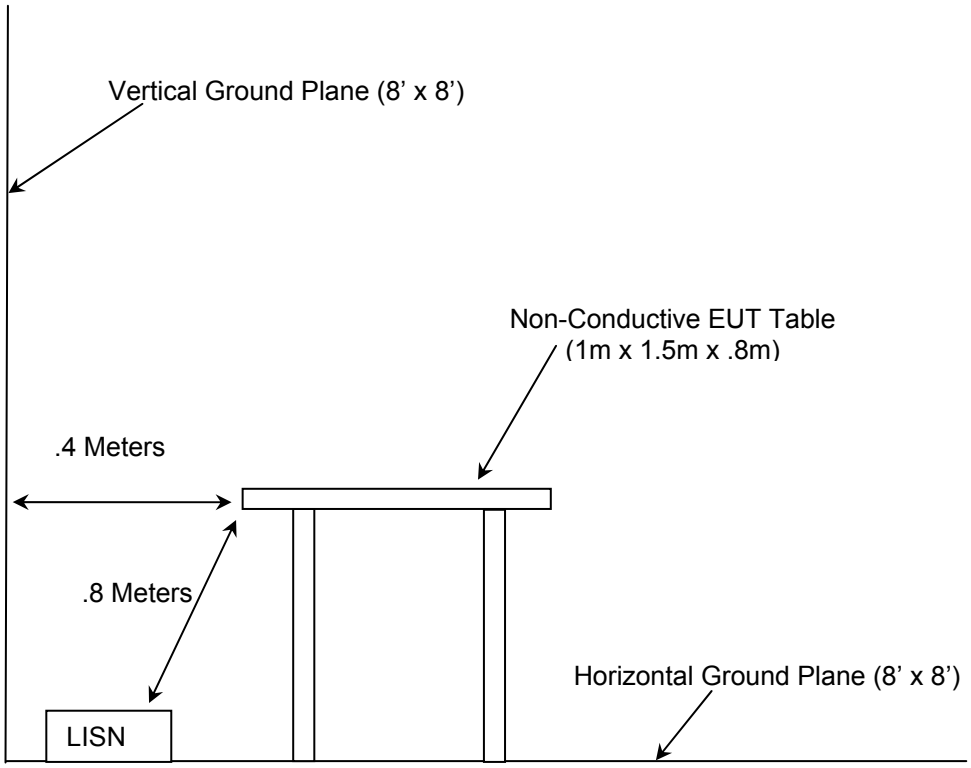


Figure 2.4-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2003: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9KHz to 40GHz
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2010
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2010
- Industry Canada Radio Standards Specification: RSS-210 - Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, Issue 7 June 2007
- Industry Canada Radio Standards Specification: RSS-GEN – General Requirements and Information for the Certification of Radiocommunication Equipment, Issue2, June 2007.

4 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

Table 4-1: Test Equipment

Equipment Calibration Information					
ACS#	**Mfg.**	**Eq. type**	**Model**	**S/N**	**Cal. Due**
1	Rohde & Schwarz	Spectrum Analyzers	ESMI - Display	833771/007	09-21-2010
2	Rohde & Schwarz	Spectrum Analyzers	ESMI-Receiver	839587/003	09-21-2010
25	Chase	Antennas	CBL6111	1043	09-02-2010
41	Electro-Metrics	Antennas	BIA-25	2925	12-14-2010
73	Agilent	Amplifiers	8447D	2727A05624	07-15-2010
78	EMCO	Antennas	6502	9104-2608	01-11-2011
153	EMCO	LISN	3825/2	9411-2268	01-11-2011
167	ACS	Cable Set	Chamber EMI Cable Set	167	01-25-2011 (See Note1)
168	Hewlett Packard	Attenuators	11947A	44829	02-04-2011 (See Note2)
193	ACS	Cable Set	OATS Cable Set	0193	01-05-2011
213	TEC	Amplifier	PA 102	44927	12-21-2010
277	Emco	Antenna	93146	9904-5199	09-18-2010
283	Rohde & Schwarz	Spectrum Analyzers	FSP40	1000033	09-21-2010
324	ACS	Cables	Belden	8214	07-15-2010
338	Hewlett Packard	Amplifiers	8449B	3008A01111	10-16-2010

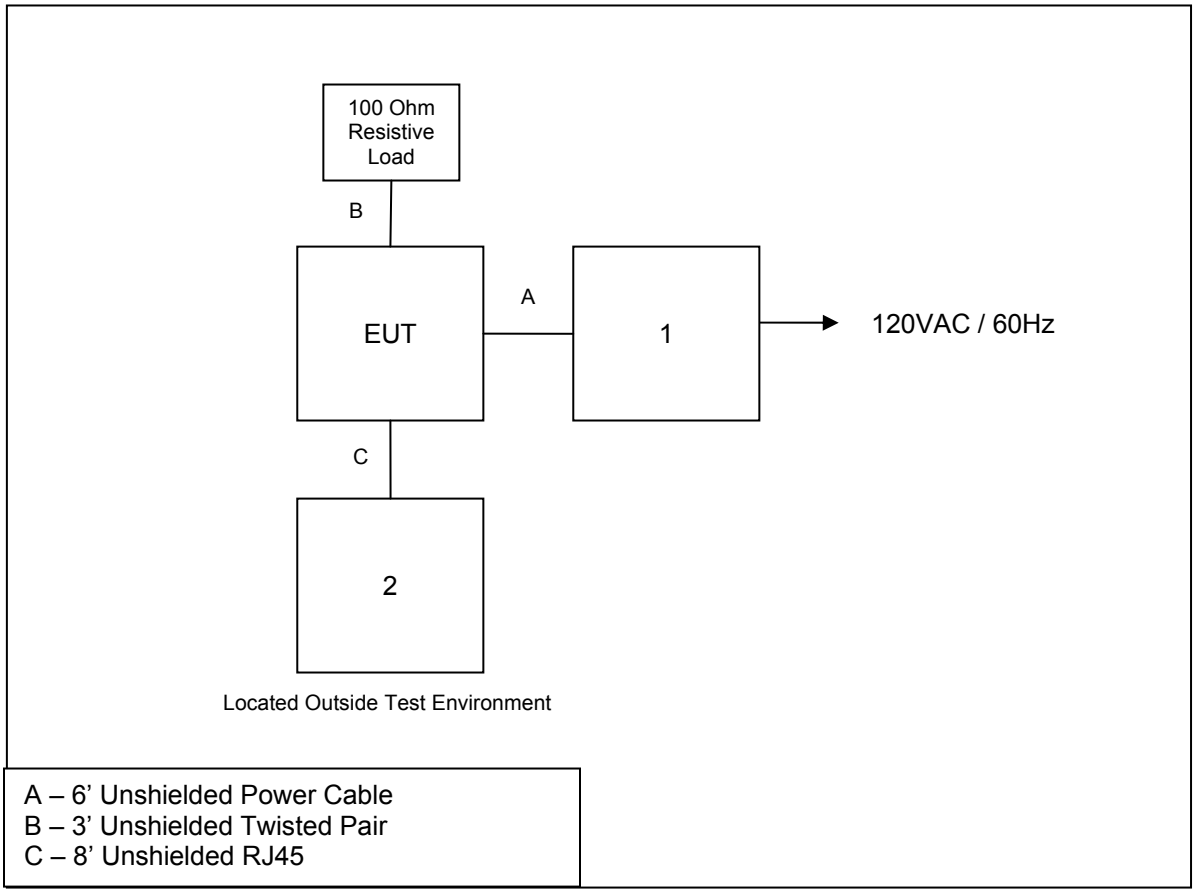
Note1: Items characterized on an annual cycle. The date shown indicates the next characterization due date.
Note2: Items verified on an annual cycle. The date shown indicates the next verification due date.

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	Power Supply	ENG	3A-123WU12	NA
2	Laptop computer	Dell	D610	N/A

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM



7 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

7.1 Antenna Requirement – FCC: Section 15.203

The Prox Reader Antenna is a wound loop type that is affixed to the inside front of the enclosure. It is comprised of an Oval Loop of 70 Turns 30ga Magnet Wire measuring ~2.1" x 1.2" and having 560uH Inductance., thus satisfying the requirement of 15.203.

7.2 Power Line Conducted Emissions – FCC: Section 15.207 IC: RSS-Gen 7.2.2

7.2.1 Measurement Procedure

ANSI C63.4 sections 6 and 7 were the guiding documents for this evaluation. Conducted emissions were performed from 150kHz to 30MHz with the spectrum analyzer's resolution bandwidth set to 9kHz and the video bandwidth set to 30kHz. The calculation for the conducted emissions is as follows:

Corrected Reading = Analyzer Reading + LISN Loss + Cable Loss
Margin = Applicable Limit - Corrected Reading

7.2.2 Measurement Results

Results of the test are shown below in and Table 7.2.2-1 to 7.2.2.2.

Table 7.2.2-1: Line 1 Conducted EMI Results

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.402	46.5	10.1	58	11.3	L1	FLO	QP
0.408	46.7	10.1	58	11	L1	FLO	QP
0.588	38.2	10	56	17.8	L1	FLO	QP
0.942	36.2	10	56	19.8	L1	FLO	QP
1.188	33.8	10	56	22.2	L1	FLO	QP
1.302	36.6	10	56	19.4	L1	FLO	QP
1.416	33.8	10	56	22.2	L1	FLO	QP
1.692	36	10	56	20	L1	FLO	QP
1.968	33.9	10	56	22.1	L1	FLO	QP
2.784	33.4	10	56	22.6	L1	FLO	QP
0.402	41.1	10.1	48	6.7	L1	FLO	AVG
0.576	30.9	10	46	15.1	L1	FLO	AVG
0.978	29.6	10	46	16.4	L1	FLO	AVG
1.218	28	10	46	18	L1	FLO	AVG
1.284	30.7	10	46	15.3	L1	FLO	AVG
1.41	27.7	10	46	18.3	L1	FLO	AVG
1.68	30.5	10	46	15.5	L1	FLO	AVG
1.998	27.6	10	46	18.4	L1	FLO	AVG
2.778	27.8	10	46	18.2	L1	FLO	AVG

Table 7.2.2-2: Line 2 Conducted EMI Results

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.402	46.4	10.1	58	11.5	L2	FLO	QP
0.408	46.7	10.1	58	11	L2	FLO	QP
0.582	37.8	10	56	18.2	L2	FLO	QP
0.99	36	10	56	20	L2	FLO	QP
1.338	36.4	10	56	19.6	L2	FLO	QP
1.71	35.8	10	56	20.2	L2	FLO	QP
2.46	32.4	10	56	23.6	L2	FLO	QP
2.904	32.8	9.9	56	23.2	L2	FLO	QP
4.494	32.2	10	56	23.8	L2	FLO	QP
4.86	32.1	10	56	23.9	L2	FLO	QP
0.402	41.1	10.1	48	6.7	L2	FLO	AVG
0.624	29.5	10	46	16.5	L2	FLO	AVG
0.966	30.3	10	46	15.7	L2	FLO	AVG
1.338	30.8	10	46	15.2	L2	FLO	AVG
1.692	30.3	10	46	15.7	L2	FLO	AVG
2.532	26.9	10	46	19.1	L2	FLO	AVG
2.898	26.5	9.9	46	19.5	L2	FLO	AVG
4.506	25.9	10	46	20.1	L2	FLO	AVG
4.884	25.8	10	46	20.2	L2	FLO	AVG

7.3 Radiated Emissions – FCC CFR 47 Part 15.209 / RSS-210 Section 2.6

7.3.1 Measurement Procedure

Section 15.33(a)(4) specifies, if the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to frequency specified in 15.33(b)(1) for unintentional radiators. The upper frequency range for the digital device is 1000MHz which greater than the 10^{th} harmonic of the fundamental frequency. The upper frequency range measured was 1000MHz.

Measurements below 30MHz were performed in a semi-anechoic chamber with a 3 meter separation distance between the EUT and measurement antenna. The EUT was rotated 360º and the loop antenna rotated about the vertical axis to maximize each emission. The magnetic loop receiving antenna was positioned with its center 1 meter above the ground.

The spectrum analyzer's resolution and video bandwidth was set to 100 Hz and 300 Hz respectively for frequencies below 150 kHz and 9 kHz and 30 kHz respectively for frequencies above 150 kHz and below 30 MHz. For measurements in the frequency bands 9-90 kHz and 110-490 kHz, an average detector was used. When average measurements are specified, the peak emissions were also compared to a limit corresponding to 20 dB above the maximum permitted average limit according to Part 15.35. All other emissions were measured using a Quasi-peak detector. The final measurements were then corrected by antenna correction factors and cable loss for comparison to the limits.

Measurements above 30 MHz were performed in a semi-anechoic chamber with a 3 meter separation distance between the EUT and measurement antenna. The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000 MHz, quasi-peak measurements were made using a resolution bandwidth (RBW) of 120 kHz and a video bandwidth (VBW) of 300 kHz.

7.3.2 Distance Correction for Measurements Below 30 MHz – Part 15.31

Radiated measurements were performed at a distance closer than 300 meters and 30m as required, according to Part 15.209. Therefore a correction factor was applied to account for propagation loss at the specified distance. The propagation loss was determined by using the square of an inverse linear distance extrapolation factor (40dB/decade) according to 15.31. A sample calculation of the distance correction factor is shown below for limits expressed at a 300m measurement distance and a 30m measurement distance.

Distance correction factor (300m Specified Test Distance) = 40*Log (Test Distance/300)
= 40*Log (3/300)
= - 80 dB

Distance correction factor (30m Specified Test Distance) = 40*Log (Test Distance/30)
= 40*Log (3/30)
= - 40 dB

7.3.3 Measurement Results

Results of the test are given in Table 7.3.3-1:

Table 7.3.3-1: Radiated Emissions Tabulated Data

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Fundamental Frequency										
0.125	68.68	68.62	---------	11.73	80.41	80.35	125.7	105.7	45.3	25.4
Spurious Emissions										
0.0636	49.76	48.78	---------	11.93	61.69	60.71	131.5	111.5	69.8	50.8
0.375	43.52	39.21	---------	11.43	54.95	50.64	116.1	96.1	61.2	45.5
0.625	---------	34.44	---------	11.48	---------	45.92	--------	71.7	---------	25.8
29.23	---------	10.67	---------	9.75	---------	20.42	--------	69.5	---------	49.1

* Note: All emissions from the intentional radiator above 29.23 MHz were attenuated below the permissible limit.

7.3.4 Sample Calculation

Example Calculation – Average/Quasi-Peak Limit < 30MHz

Measurement Distance 300m @ 125kHz

Limit (dBuV/m) = 20*Log(2400/F(kHz)) - Distance Correction Factor (Section 7.3.2)
Limit (dBuV/m) = 20*Log(2400/125) + 80
Limit (dBuV/m) = 105.7

Example Calculation - 125kHz Fundamental (See Table 7.3.2-1)
$R_C = R_U + CF_T$
Where:
CF_T = Total Correction Factor (AF+CA+AG)
R_U = Uncorrected Reading
R_C = Corrected Level
AF = Antenna Factor
CA = Cable Attenuation
AG = Amplifier Gain

AVERAGE:
Corrected Level: 68.62 + 11.73 = 80.35dBuV
Margin: 105.7dBuV – 80.35dBuV = 25.4 dB

7.4 20dB / 99% Bandwidth – FCC: Section 15.215(c) / IC: RSS-210 Section 4.6.1

7.4.1 Measurement Procedure

The spectrum analyzer span was set to 2 to 3 times the estimated bandwidth of the emission. The RBW was to ≥ 1% of the estimated emission bandwidth. The trace was set to max hold with a peak detector active. The Delta function of the analyzer was utilized to determine the 20 dB bandwidth of the emission.

The 99% occupied bandwidth was measured with the spectrum analyzer span set to fully display the emission and approximately 20dB below the peak level. The RBW was to ~ 1% to 3% of the approximate emission width. The trace was set to max hold with a peak detector active. The occupied bandwidth measurement function of the analyzer was used for the 99% bandwidth.

7.4.2 Measurement Results

Results are shown below in table 7.4.2-1 and figure 7.4.2-1 to 7.4.2-2:

Table 7.4.2-1: 20dB / 99% Bandwidth

Frequency [kHz]	20dB Bandwidth [Hz]	99% Bandwidth [Hz]
125	266	223.2

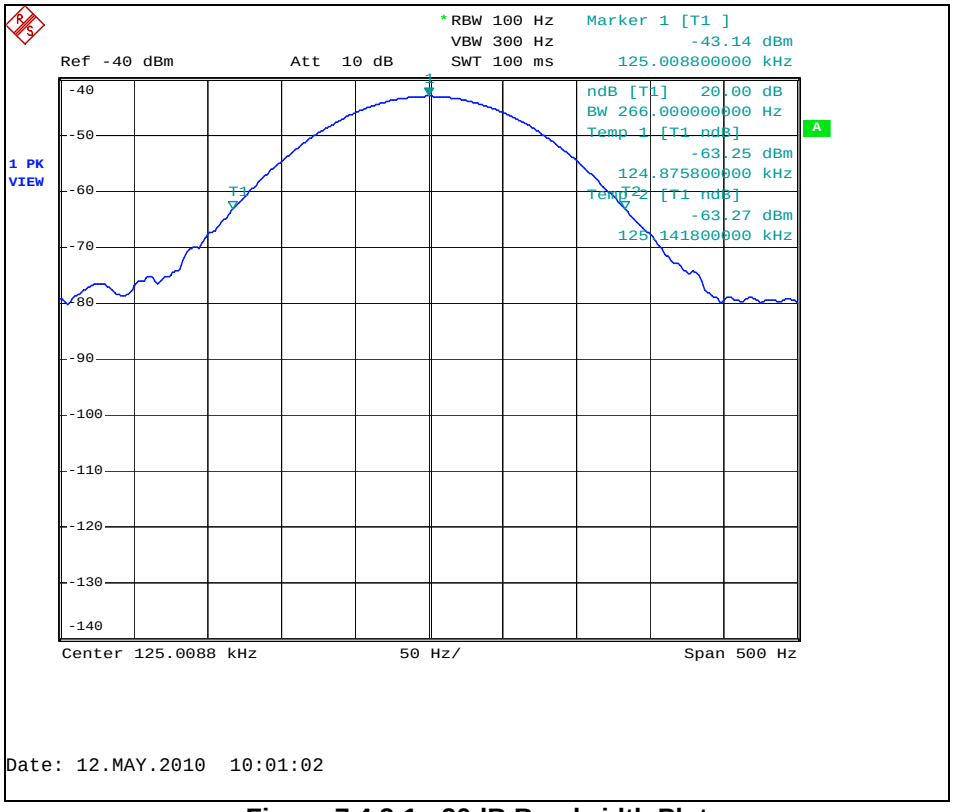


Figure 7.4.2-1: 20dB Bandwidth Plot

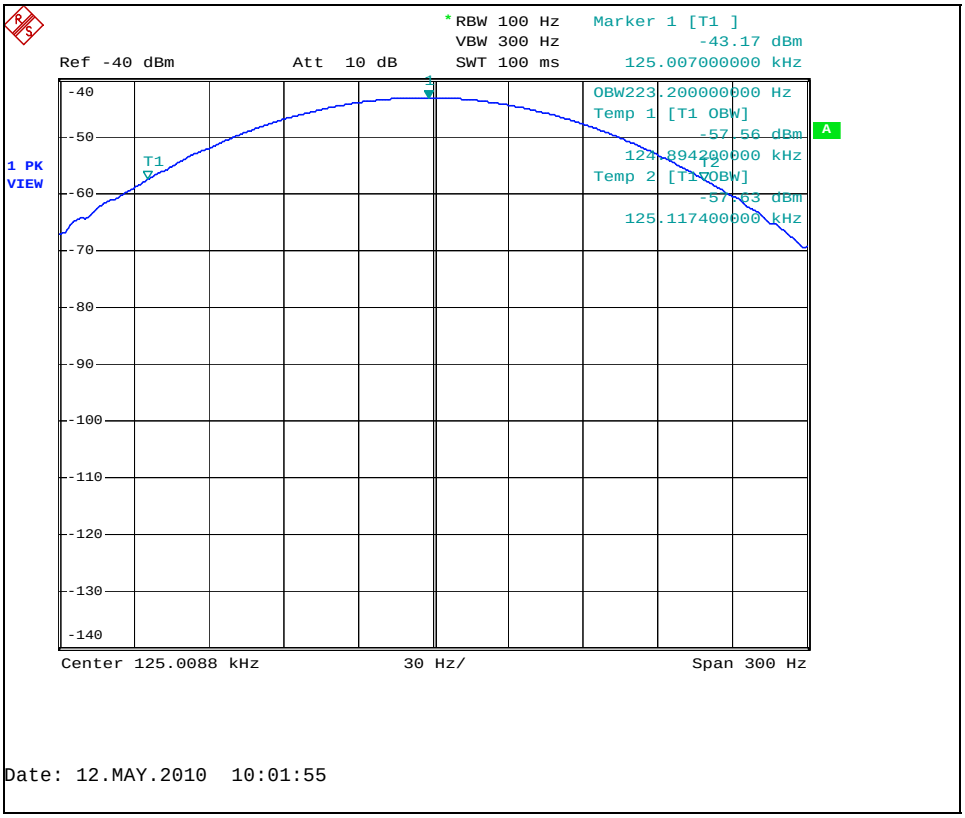


Figure 7.4.2-2: 99% Bandwidth Plot

7.5 Radiated Emissions – FCC: Section 15.109(Unintentional Radiation) IC: RSS-210 2.6

7.5.1 Measurement Procedure

Radiated emissions tests were performed over the frequency range of 30MHz to 1GHz. Measurements of the radiated field strength were evaluated to the Class A limits specified in 15.109(a) and made at a distance of 10 m from the boundary of the equipment under test (EUT) and the receiving antenna. The antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. Radiated measurements above 30MHz and below 1GHz were made with the Spectrum Analyzer's resolution bandwidth set to 120 KHz using a Quasi-peak detector. Above 1GHz, peak and average measurements are taken with the RBW and VBW were set to 1MHz.

7.5.2 Measurement Results

Results of the test are given in Table 7.5.2-1:

Table 7.5.2-1: Radiated Emissions Tabulated Data

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
158.25	---------	35.53	V	-8.05	---------	27.49	--------	43.5	---------	16.0
335.38	---------	43.45	V	-8.70	---------	34.75	--------	46.4	---------	11.7
348.01	---------	44.90	V	-8.22	---------	36.68	--------	46.4	---------	9.7
354.41	---------	45.86	V	-7.97	---------	37.89	--------	46.4	---------	8.5
360.87	---------	47.33	V	-7.83	---------	39.50	--------	46.4	---------	6.9
373.81	---------	47.20	V	-7.83	---------	39.37	--------	46.4	---------	7.0
386.74	---------	50.11	V	-7.47	---------	42.64	--------	46.4	---------	3.8
399.67	---------	42.88	H	-7.50	---------	35.38	--------	46.4	---------	11.0

* Note: All emissions above 399.67 MHz were attenuated below the permissible limit.

8 CONCLUSION

In the opinion of ACS, Inc., the PC600, manufactured by Lathem Time Corp. meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210.

END REPORT