

**TEST REPORT #160799**

**STANDARD: FCC PART 15**

**SUBPART B--UNINTENTIONAL RADIATORS  
SECTION 15.109 RADIATION EMISSION LIMITS**

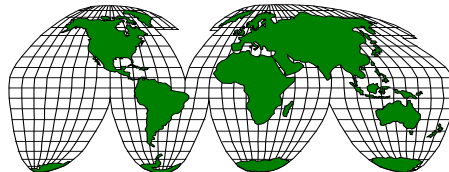
**EQUIPMENT TESTED:**

**LACROSSE TECHNOLOGY, LTD.**

**MODEL: WS2000PC-2  
PC PERIPHERAL PLUG-IN**

**TEST DATE: 16 JULY 1999**

1100 Falcon Avenue  
Glencoe, MN 55336



**INTERNATIONAL**  
**CERTIFICATION SERVICES, INC.**

Tele: 320-864-4444  
Fax: 320-864-6611

**Prepared for:** LaCrosse Technology, Ltd.  
1116 South Oak Street  
LaCrescent, MN 55447

**Test agent:** International Certification Services, Inc.  
1100 Falcon Avenue  
Glencoe, MN 55336  
Tele: 320-864-4444  
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**Test location:** International Certification Services, Inc.  
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Glencoe, MN 55336  
Tele: 320-864-4444  
Fax: 320-864-6611

**Prepared by:** International Certification Services, Inc.  
1100 Falcon Avenue  
Glencoe, MN 55336

International Certification Services represents to the client that testing is done in accordance with standard procedures applicable and that reported test results are accurate within generally accepted commercial ranges of accuracy.

This report only applies to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. International Certification Services shall have no liability for any deductions, inferences or generalizations drawn by the client or others from this report.

This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full without our written approval.

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## 1.0 TEST SUMMARY

<b>TEST REPORT:</b> #160799	
<b>COMPANY:</b>	LaCrosse Technology, Ltd.
<b>AGENT:</b>	International Certification Services, Inc.
<b>PHONE:</b>	320-864-4444
<b>TEST DATE:</b>	16 July, 1999
<b>EQUIPMENT UNDER TEST:</b>	PC Peripheral Plug-In weather station Model: WS2000PC-2
<b>GENERAL TEST SUMMARY:</b> The testing was performed at International Certification Services, Inc. at 1100 Falcon Ave, Glencoe, MN 55336	
<b>VERIFICATION / CERTIFICATION STATUS:</b>	The PC Peripheral Plug-In weather station Model: WS2000PC-2 was found to be in compliance with the FCC Part 15 Subpart B, Section 15.109 requirements.
<b>MODIFICATIONS NECESSARY:</b>	None

### **TESTED BY**

Gerald Heinen

### **WRITTEN BY**

Duane R. Bagdons

## **2.0 Applicable Standards**

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47 CFR Ch.1 (10-1-98 Edition)

FCC Part 15 Radio Frequency Devices

Subpart B Unintentional Radiators

Section 15.109 Radiated Emission Limits

## 2.1 Referenced Standards

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.

## 2.2 Equipment Units Tested

The equipment tested was a PC peripheral device that plugs into the serial port of a PC and performs a weather station data interface. The model: WS2000PC-2 receives DC power from the computer. The EUT has a microprocessor that controls the digital interface between the external sensors and the computer. A super-regenerative type receiver (HFS301-WS) is included in the EUT to receive data information from the external sensors. The receiver has been approved by the FCC under Part 15 subpart B.

## 2.3 Equipment and Cable Configuration

See photos of the EUT pc board and schematic and test configuration setup in Attachment A

## 2.4 List of Test Equipment

<u>Test Equipment</u>	<u>Model</u>	<u>S/N</u>	<u>Calibration Date</u>
Spectrum Analyzer	Hewlett-Packard 8566B	2421A00458	3/10/99
Preamp	MiniCircuits ZKL-2R7	N/A	6/1/99
Biconical Antenna	AH Systems Model SAS-200/540	328	6/16/99
Log Periodic Antenna (200-1000 MHz)	EMCO 3146	9111-3280	6/16/99

Measurement cable losses, and antenna correction factors are included in the data sheets. Quasi-Peak detection methods were used in the measurements. The Resolution BW was set at 100 KHz and the Video BW was set at 300 KHz.

## 2.5 Units of Measurement.

All measurements were taken in dBuV/m with the antenna located at 3 meters distance from the EUT. Frequency measurements are recorded in Mhz

## 2.6 Location of Test Site

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The open area test site (OATS) measurement facility used to collect the data was International Certification Services, Inc. at 1100 Falcon Ave in Glencoe, MN 55336. This site has been certified to be in spec of the normalized site attenuation per ANSI C63.4-1992. See letter of compliance from FCC dated July 23, 1998. (FCC 31040/SIT 1300F2)

## 2.7 Measurement Procedures

The WS2000PC-2 was plugged into a serial port of a Gateway computer as an operating platform. The specific operating system was activated to monitor the incoming data from external sensors and log that data into the computer and display it on the monitor.

A driving signal was induced into the receiver by using a stick antenna driven by a signal generator. The generator was tuned to 433.92 Mhz and the output amplitude was set to a very low level (-30 dBm) just enough to excite the receiver. Receiver activity was monitored with an oscilloscope.

The receiving antenna was placed at a distance of 3 meters from the EUT. The EUT was set on an insulating table in the OATS site and rotated through 360 degrees to determine the worst case EUT orientation. The antenna was then positioned vertical and horizontal to determine which antenna polarity orientation was worst case. Then certification data was recorded at all the frequencies from the fundamental to the 10<sup>th</sup> harmonic at an antenna height variation of from 1-4 meters.

## 2.8 Reporting Measurement Data

See data sheets and plots in Attachment B.

## 2.9 Radiated Emissions Data

The frequency and amplitude of the tuned frequency of the EUT along with the frequencies and amplitudes of the harmonics are reported in the data sheets in Attachment B. This information is plotted against the limit of section 15.109 of FCC Part 15 subpart B. The polarization of the antenna for each measurement is also recorded.

The Final Level, expressed in dBuV/m, is arrived at by taking the reading from the spectrum analyzer (Level dBuV) and adding the antenna correction factor and cable loss factor (Factor dB) and subtracting the preamp gain. This result then has the FCC limit subtracted from it to provide the margin which gives the tabular data as shown in the data sheets in Attachment B.

Example:

<u>Frequency</u> <u>(MHz)</u>	<u>Level</u> <u>(dBuV)</u>	+	<u>Factor</u> <u>(dB)</u>	=	<u>Corr Data</u> <u>(dBuV/m)</u>	-	<u>FCC Limit</u> <u>(dBuV/m)</u>	=	<u>Margin</u> <u>(dB)</u>
100.0	20.6	+	11.0	=	31.6	-	43.5	=	-11.9

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## 2.10 Operating Frequency Data for Intentional Radiators

All operating frequencies and harmonic frequencies and ambient temperature at which all data was taken at is recorded in the data sheets in Attachment B.

## 2.11 Summary of Results

The EUT passed the requirements of FCC Part 15 Subpart B, Section 15.109 with a minimum passing margin of **-4.543 dBuV/m at 32.1 Mhz**. No modifications were necessary to accomplish this compliance.

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# ATTACHMENT A

## RADIATED MEASUREMENT SCHEMATIC, PHOTOS AND TEST CONFIGURATION

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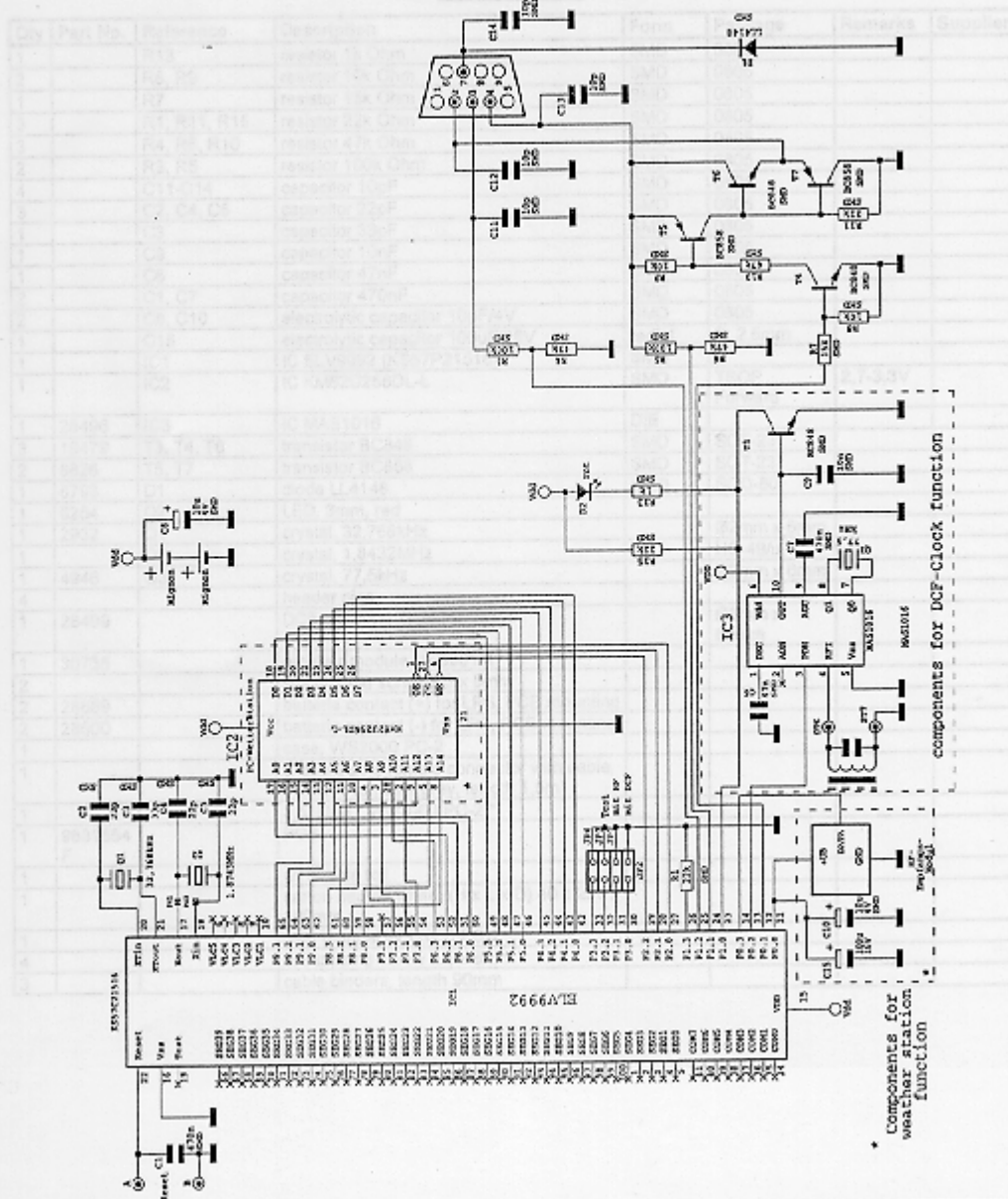
*CERTIFICATION SERVICES, INC.*

Model: WS2000PC-2 Plug In Computer Peripheral Electrical Schematic

PC Peripheral (Plug-in)

ELV	Item: WS2000PC-2 Part Number: 31772	Page: 6/12 Version: 1.2
	Assembly Documentation	Date: 22.03.99

6 Schematic Diagram



Prepared/Checked <i>Jahden</i>	Checked <i>V. Adames</i>	Appr. by technical director	Appr. by development dir. <i>Z. Golof</i>
Date 22.03.99	Date 24.3.99	Date	Date 22.3.99

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## Test Configuration (Front View)



WS2000PC-2 PC Peripheral  
DataLogger

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## Test Configuration (Rear View)



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## Test Configuration (Rear I/O Panel)



Speaker port

UDP ports

Mouse

Keyboard

Printer Port

Ws2000PC-2 PC  
Peripheral Data Logger

Ethernet

Monitor

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WS2000PC-2 PC Peripheral DataLogger

Product Assembly

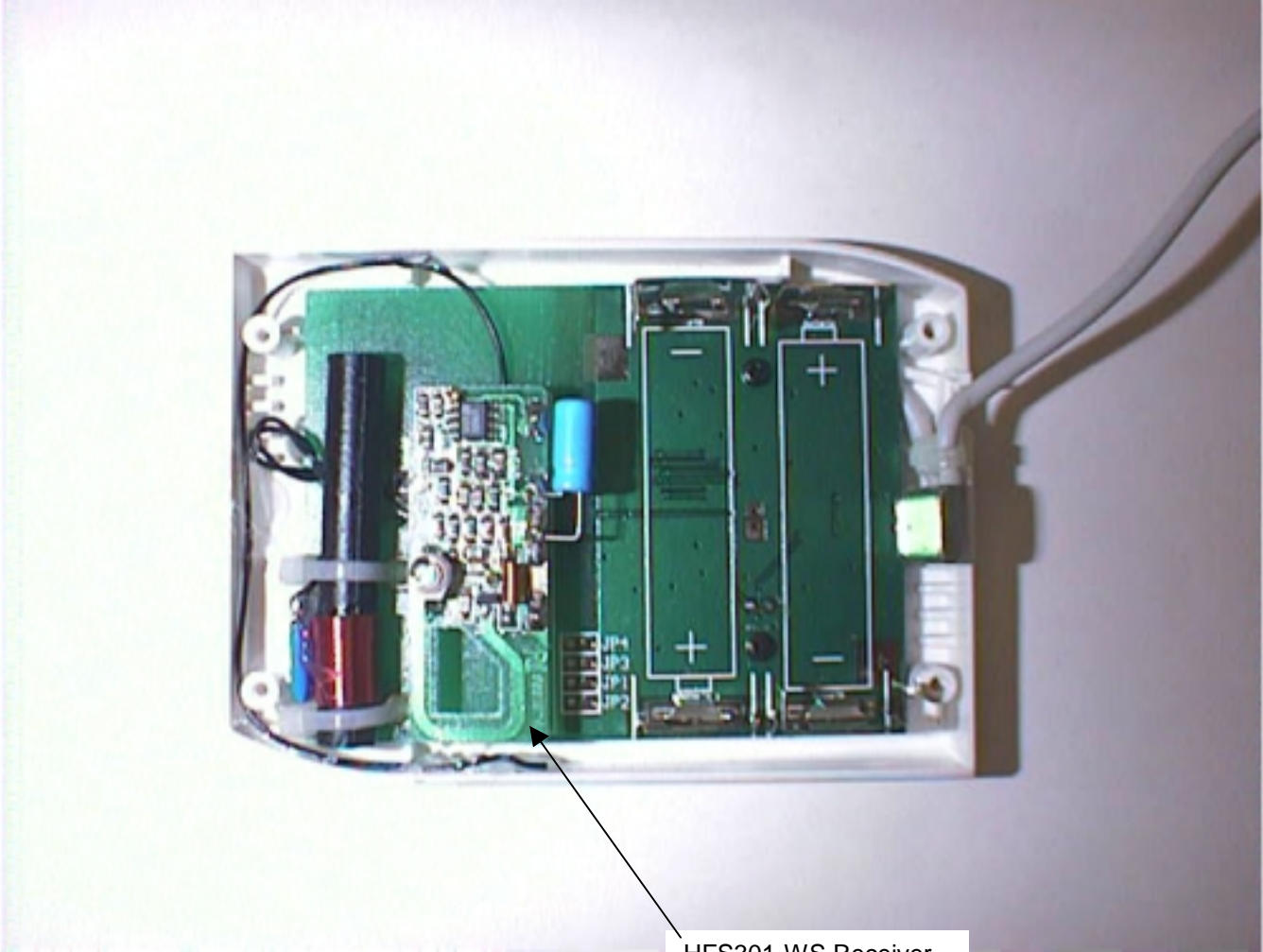


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WS2000PC-2 PC Peripheral DataLogger PC Board  
Including HFS 301-WS Receiver assembly



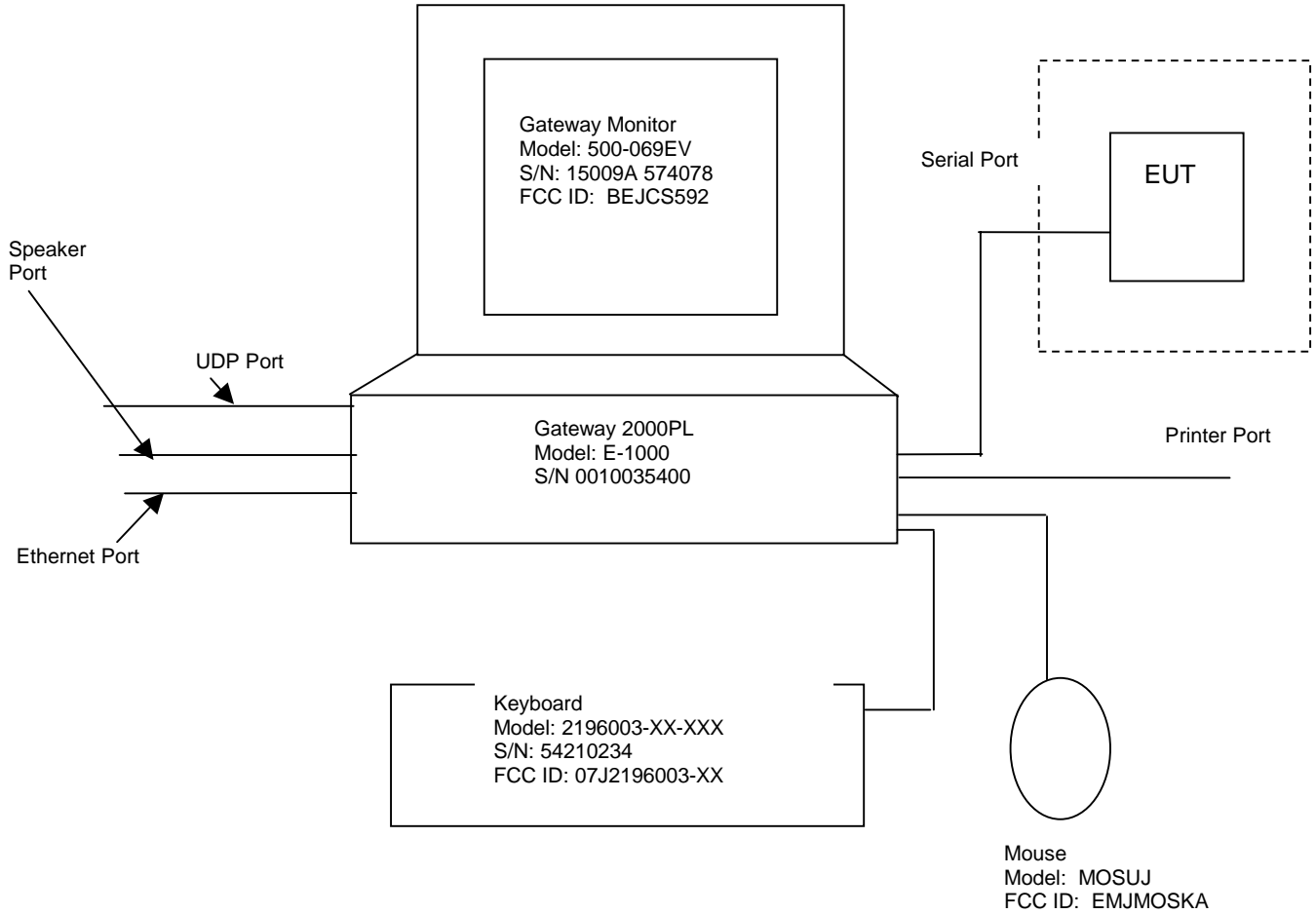
HFS301-WS Receiver

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# WS2000PC PC Peripheral Datalogger Test Configuration



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## **ATTACHMENT B**

### **DETAILED TEST DATA SHEETS**

Each radiated emissions plot indicates the receiving antenna measurement distance in meters and the emission amplitudes with respect to their applicable limits. The associated tabulation for each radiated plot lists the emission frequency, the final emission level, and the margin from the limit.

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LaCrosse Technology, Ltd.  
 Model: WS2000PC-2 PC Peripheral DataLogger  
 Temperature: 80 Deg F.  
 Humidity: 66 % R.H.

Test Technician: Gerald Heinen

Preliminary tests were performed on antenna polarities of Vertical and Horizontal. Horizontal was the worst case so all data was taken with an antenna polarity of Horizontal.

Initial testing was performed in the anechoic shield room to determine what emissions were present and a list was made to test on the OATS site.

Certification testing was performed at the OATS site with an antenna distance of 3 meters and the EUT at 90 Degrees to the antenna.

The limit for section 15.109 is 100 uV/m from 30-88 Mhz, 150 uV/m from 88-216, 200 uV/m from 216-960 Mhz and 500 uV/m above 960 Mhz. All data is taken with the required Quasi-Peak Detector. This converted to dBuV is the limit shown in the next table.

Freq (Mhz)	Ampl (dbuV)	Ant Corr Fac	Cable Corr Fac	Corr Data (dBuV)	FCC 15.109 limit	Margin
32	42.9	13.24	1.1	35.24	40	-4.76
<b>32.1</b>	<b>43.15</b>	<b>13.212</b>	<b>1.0946</b>	<b>35.457</b>	<b>40</b>	<b>-4.543</b>
33.6	42.5	12.792	1.028	34.32	40	-5.68
34	42.55	12.68	1.01	34.24	40	-5.76
58.2	45.15	9.908	0.7604	33.8184	40	-6.1816
134.975	46.65	11.3985	0.97502	37.0235	43.52	-6.4965
154.1	47	12.282	0.9941	38.2761	43.52	-5.2439
158.6	45.65	12.516	0.9986	37.1646	43.52	-6.3554
433.955	45.9	16.2187	4.46085	44.5795	46.02	-1.4405
896.25	36.2	23.2	1.8772	39.2772	46.02	-6.7428

Minimum Passing Margin

Signal Gen Output





**ATTACHMENT C**

**PRODUCT DATA SHEET OR PRODUCT INFORMATION FORM AS  
SUPPLIED BY THE CUSTOMER**

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**COMPANY NAME:** LaCrosse Technology, Ltd.

**CUSTOMER REPRESENTATIVE:** International Certification Services, Inc.

**EQUIPMENT DESCRIPTION:** PC Peripheral DataLogger

**MODEL NUMBER:** WS2000PC-2

**SERIAL NUMBER:** Engineering Unit

**TYPE OF TEST:** \_\_\_\_\_ Development  
\_\_\_\_\_ Initial Design Verification  
\_\_\_\_\_ Design Change (Please describe exact changes below)  
  X   Production Sample (Audit Test)

Changes made: NONE

**OSCILLATOR FREQUENCIES:**

1.8432 Mhz

**PRODUCT SHIELDING PROVISION:**

Plastic enclosure

**SOFTWARE AND / OR OPERATING MODES:**

Software is provided by a CD that is included in the product package. The software monitors the input sensors and processes the information and displays it on the computer monitor and logs it into the computer.

**I/O CABLES:**

Serial port connection cable

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