FCC PART 15, SUBPART B and C
TEST REPORT

for

WIRELESS SERIAL SERVER

MODEL: TROY500

Prepared for

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GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Compatible Electronics Inc., which is an independent testing and consulting firm. The test report is based on testing performed by Compatible Electronics personnel according to the measurement procedures described in the test specifications given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced without the written permission of Compatible Electronics, unless done so in full.

This report must not be used to claim product endorsement by NVLAP, NIST, or any other agency of the U.S. Government.

Device Tested:	Wireless Serial Server Model: TROY500 S/N: N/A
Product Description:	See Expository Statement.
Modifications:	The EUT was not modified during the testing.
Manufacturer:	Troy Group, Inc. 2331 South Pullman Street Santa Ana, California 92705
Test Dates:	September 24, 27, 28, and 29 2004
Test Specifications:	EMI requirements Limits: **Class B** of CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.207, 15.209, and 15.247
Test Procedure:	ANSI C63.4: 2003
Test Deviations:	The test procedure was not deviated from during the testing.

SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	RESULTS
1	Conducted RF Emissions, 150 kHz – 30 MHz	Complies with the **Class B** limits of CFR Title 47, Part 15, Subpart B; and the limits of CFR Title 47, Part 15, Subpart C, section 15.207
2	Spurious Radiated RF Emissions, 30 MHz – 1000 MHz	Complies with the **Class B** limits of CFR Title 47, Part 15, Subpart B; and the limits of CFR Title 47, Part 15, Subpart C, section 15.209
3	Spurious Radiated RF Emissions, 10 kHz – 30 MHz and 1000 MHz – 25000 MHz	Complies with the **Class B** limits of CFR Title 47, Part 15, Subpart B; and CFR Title 47, Part 15, Subpart C, section 15.247(c)
4	Fundamental and Emissions produced by the intentional radiator in non-restricted bands, 10 kHz – 25 GHz	Complies with the relevant requirements of CFR Title 47, Part 15, Subpart C, section 15.247(c)
5	Emissions produced by the intentional radiator in restricted bands, 10 kHz – 25 GHz	Complies with the relevant requirements of CFR Title 47, Part 15, Subpart C, section 15.205, 15.209(a), and section 15.247 (c)
6	6 dB Bandwidth	Complies with the relevant requirements of CFR Title 47, Part 15, Subpart C, section 15.247(a)(2)
7	Peak Power Output	Complies with the relevant requirements of CFR Title 47, Part 15, Subpart C, section 15.247(b)(3)
8	RF Conducted Antenna Test	Complies with the relevant requirements of CFR Title 47, Part 15, Subpart C, section 15.247(c)
9	Peak Power Spectral Density Conducted from the Intentional Radiator to the Antenna Port	Complies with the relevant requirements of CFR Title 47, Part 15, Subpart C, section 15.247 (d)

1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the Wireless Serial Server Model: TROY500. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4: 2003. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT hereafter, are within the specification limits defined by the **Class B** limits of CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.207, 15.209, and 15.247.

2. ADMINISTRATIVE DATA

2.1 Location of Testing

The EMI tests of the testing described herein were performed at the test facility of Compatible Electronics at the following location:

114 Olinda Drive, Brea, California 92823

2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The calibration is traceable to the National Institute of Standards and Technology (NIST).

2.3 Cognizant Personnel

Troy Group, Inc.

Ronald Tozaki	Senior Hardware Engineer

Compatible Electronics, Inc.

Benigno Chavez	Test Technician
Arnold Gaffud	Sr. Test Engineer
Kyle Fujimoto	Test Engineer
Michael Christensen	Lab Manager

2.4 Date Test Sample was Received

The test sample was received on September 24, 2004.

2.5 Disposition of the Test Sample

The sample was returned to Troy Group, Inc. on October 15, 2004.

2.6 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document.

RF	Radio Frequency
EMI	Electromagnetic Interference
EUT	Equipment Under Test
P/N	Part Number
S/N	Serial Number
HP	Hewlett Packard
ITE	Information Technology Equipment
CML	Corrected Meter Limit
LISN	Line Impedance Stabilization Network

3. APPLICABLE DOCUMENTS

The following documents are referenced or used in the preparation of this EMI Test Report.

SPEC	TITLE
FCC Title 47, Part 15 Subpart C	FCC Rules - Radio frequency devices (including digital devices) – Intentional Radiators
ANSI C63.4 2003	Methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz
FCC Title 47, Part 15 Subpart B	FCC Rules - Radio frequency devices (including digital devices) – Unintentional Radiators

4. DESCRIPTION OF TEST CONFIGURATION

4.1 Description of Test Configuration - EMI

The Wireless Serial Server Model: TROY500 (EUT), though one unit, was tested and operated in three separate configuration modes: RS-232, RS-422, and RS-485. The complete EMI tests were performed, however they were split up amongst the three configurations (see the EMI test matrix on the next page). The three configuration modes were as follows:

1. In the RS-232 mode, the EUT was connected to a laptop (Omnibook XE2), Ethernet switch, and its AC adapter via its serial, Ethernet, and power ports, respectively. The Ethernet switch was also connected to a laptop (Omnibook XE3) and its AC adapter via its Ethernet and power ports, respectively. Both laptops were also connected to their relevant AC adapters via their power ports. Data was being passed back and forth between the two laptops, via the EUT, by utilizing MS-DOS prompts and Telnet commands. Also, the Omnibook XE3 laptop was pinging the WLAN on a continuous basis.

2. In the RS-422 mode, the EUT was connected to an RS-232-to-RS-422/485 Converter (itself connected to the Omnibook XE2 laptop via its ethernet port), Ethernet switch, and its AC adapter via its serial, Ethernet, and power ports, respectively. The Ethernet switch was also connected to a laptop (Omnibook XE3) and its AC adapter via its Ethernet and power ports, respectively. Both laptops and the RS-232-to-RS-422/485 converter were all connected to their respective AC adapters via their power ports. Data was being sent back and forth between the two laptops, via the EUT, by utilizing MS-DOS prompts and Telnet commands. Also, the Omnibook XE3 laptop was pinging the WLAN on a continuous basis.

3. In the RS-485 mode, the EUT was connected to an Alpha sign and Ethernet switch via its serial and Ethernet ports, respectively. In this mode the EUT received its power from the Alpha sign. The Ethernet switch was also connected to a laptop (HP #1) and its AC adapter via its Ethernet and power ports, respectively. The laptop (HP #1) and Alpha sign were also connected to their relevant AC adapters via their power ports. Data was being passed from the laptop (Omnibook XE3) to the Alpha sign, via the EUT, by utilizing MS-DOS prompts and Telnet commands. Also, the Omnibook XE3 laptop was pinging the WLAN on a continuous basis.

   Note: In the RS-485 mode, AC Power Line conducted emissions tests were conducted on the Alpha sign's AC adapter.

The host equipment portion for the EUT was tested to EN 55022 for radiated emissions. Per clause 5.5.2.2 of EN 300 328 V1.4.1 (2003-04), "For radiated emission tests the most appropriate standard shall be applied to the host equipment. The plug-in radio device shall meet the radiated requirements as describe in clauses 4.3.4 and 4.3.5 [of EN 300 328 V1.4.1 (2003-04)]" The EN 55022 standard is the most appropriate standard for the host equipment.

4.2 Description of Test Configuration – EMI (Continued)

	RS-232 Mode with 120-240 VAC Adapter	RS-422 Mode with 120-240 VAC Adapter	RS-485 Mode: power via Alpha Sign (115 VAC)
-6 dB Bandwidth	X		
-20 dB Bandwidth	X		
RF Antenna Conducted	X		
Spectral Density Output	X		
Radiated Emissions on the Transmitter Portion	X	X	X
Radiated Emissions on the Receiver Portion	X	X	X
Conducted Emissions on AC Power Lines	X	X	X
Radiated Emissions on the Digital Portion	X	X	X

EMI Test Matrix

For the Radiated Emissions on the Transmitter Portion and Radiated Emissions on the Receiver Portion, it was determined after an initial investigation that the RS-232 mode was worst case and the final data was taken in that mode. For the Conducted Emissions on AC Power Lines and for Radiated Emissions on the Digital Portion, the data was taken in full for all modes. Please note that for the direct measurement tests, the different modes have no effect on the output power, hence only the RS-232 mode was performed on the direct measurement tests.

It was determined that the emissions were at their highest level when the EUT was operating in the above configurations. The cables were moved to maximize the emissions. All initial investigations were performed with the spectrum analyzer and/or EMI Receiver in manual mode scanning the frequency range continuously. The cables were bundled and routed as shown in the photographs in Appendix D. Please see the data sheets located in Appendix E.

4.1.1 Cable Construction and Termination for RS-232 Mode

Cable 1 This is a 6.67 foot unshielded cable connecting the EUT to the AC Adapter. It has a 1/8 inch power connector at the EUT end and is hard wired into the AC Adapter.

Cable 2 This is a 30 foot unshielded cable connecting the EUT to the ethernet switch. It has RJ-45 connectors at each end.

Cable 3 This is a 30 foot unshielded cable connecting the EUT to the Omnibook XE2 Laptop. It has a D-9 pin metallic connector to RJ-45 adapter at the EUT end and a D-9 pin metallic connector at the Omnibook XE2 Laptop end.

Cable 4 This is a 3.33 foot unshielded cable connecting the ethernet switch to the Omnibook XE3 Laptop. It has an RJ-45 connector at each end.

Cable 5 This is a 6 foot unshielded cable connecting the ethernet switch to the AC Adapter. It has a 1/8 inch power connector at the EUT end and is hard wired into the AC Adapter.

Cable 6 This is a 6 foot unshielded cable connecting the Omnibook XE2 Laptop to the AC Adapter. It has a 1/8 inch power connector at the Omnibook XE2 Laptop end and is hard wired into the AC Adapter. The cable has a molded ferrite at the Omnibook XE2 Laptop end.

Cable 7 This is a 6 foot unshielded cable connecting the Omnibook XE3 Laptop to the AC Adapter. It has a 1/8 inch power connector at the Omnibook XE3 Laptop end and is hard wired into the AC Adapter. The cable has a molded ferrite at the Omnibook XE3 Laptop end.

4.1.2 Cable Construction and Termination for RS-422 Mode

Cable 1 This is a 6.67 meter unshielded cable connecting the EUT to the AC Adapter. It has a 1/8 inch power connector at the EUT end and is hard wired into the AC Adapter.

Cable 2 This is a 30 foot unshielded cable connecting the EUT to the ethernet switch. It has RJ-45 connectors at each end.

Cable 3 This is a 25 foot unshielded cable connecting the EUT to the RS-232-to-RS-422/485 converter. It has a D-9 pin metallic connector at each end.

Cable 4 This is a 3.33 foot unshielded cable connecting the RS-232 to RS-422/485 converter to the Omnibook XE2 laptop. It has an RJ-45 connector at each end.

Cable 5 This is a 3.33 foot unshielded cable connecting the ethernet switch to the Omnibook XE3 Laptop. It has an RJ-45 connector at each end.

Cable 6 This is a 6 foot unshielded cable connecting the ethernet switch to the AC Adapter. It has a 1/8 inch power connector at the EUT end and is hard wired into the AC Adapter.

Cable 7 This is a 6 foot unshielded cable connecting the Omnibook XE2 Laptop to the AC Adapter. It has a 1/8 inch power connector at the Omnibook XE2 Laptop end and is hard wired into the AC Adapter. The cable has a molded ferrite at the Omnibook XE2 Laptop end.

Cable 8 This is a 6 foot unshielded cable connecting the Omnibook XE3 Laptop to the AC Adapter. It has a 1/8 inch power connector at the Omnibook XE3 Laptop end and is hard wired into the AC Adapter. The cable has a molded ferrite at the Omnibook XE3 Laptop end.

Cable 9 This is a 6 foot unshielded cable connecting the RS-232-to-RS-422/485 converter to the AC Adapter. It has a 1/8 inch power connector at the RS-232-to-RS-422/485 converter end and is hard wired into the AC Adapter.

4.1.3 Cable Construction and Termination for RS-485 Mode

Cable 1 This is a 30 foot unshielded cable connecting the EUT to the ethernet switch. It has RJ-45 connectors at each end.

Cable 2 This is a 3.33 foot unshielded cable connecting the ethernet switch to the Omnibook XE3 Laptop. It has an RJ-45 connector at each end.

Cable 3 This is a 6 foot unshielded cable connecting the ethernet switch to the AC Adapter. It has a 1/8 inch power connector at the EUT end and is hard wired into the AC Adapter.

Cable 4 This is a 6 foot unshielded cable connecting the Omnibook XE3 Laptop to the AC Adapter. It has a 1/8 inch power connector at the Omnibook XE3 Laptop end and is hard wired into the AC Adapter. The cable has a molded ferrite at the Omnibook XE3 Laptop end.

Cable 5 This is a 3.33 foot braid shielded cable connecting the Alpha Sign to the EUT. It has an RJ-12 and terminal block connector at the Alpha Sign end and a D-9 pin metallic connector at the EUT end. The shield of the cable is grounded to the chassis via the connector. The cable contains a clamp ferrite at the Alpha sign end.

Cable 6 This is a 10 foot unshielded cable connecting the Alpha sign to its AC adapter. It has a metallic barrel connector at the Alpha sign end and is hard wired at the AC adapter end. The cable was bundled to a length of 1 meter. The cable contains a clamp ferrite at the Alpha sign end.

5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

5.1 EUT and Accessory List for RS-232 Mode

EQUIPMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER
WIRELESS SERIAL SERVER	TROY GROUP, INC.	TROY500	#7 (EUT), #8 (CF)
AC ADAPTER (EUT)	POTRANS ELECTRICAL CORPORATION	UP00531050	N/A
ETHERNET SWITCH	AIRLINK	ASW105/A3	0420A3A12982
AC ADAPTER (ETHERNET SWITCH)	GENERIC	DV-0751AS	N/A
LAPTOP	HEWLETT PACKARD	OMNIBOOK XE2	TW03204580
AC ADAPTER (LAPTOP OMNIBOOK XE2)	HEWLETT PACKARD	HP F1454A	002911252
LAPTOP	HEWLETT PACKARD	OMNIBOOK XE3	TW13113065
AC ADAPTER (LAPTOP FOR OMNIBOOK XE3)	HEWLETT PACKARD	HP F1781A	01253455

5.2 EUT and Accessory List for RS-422 Mode

EQUIPMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER
WIRELESS SERIAL SERVER	TROY GROUP, INC.	TROY500	#7 (EUT), #8 (CF)
AC ADAPTER (EUT)	POTRANS ELECTRICAL CORPORATION	UP00531050	N/A
ETHERNET SWITCH	AIRLINK	ASW105/A3	0420A3A12982
AC ADAPTER (ETHERNET SWITCH)	GENERIC	DV-0751AS	N/A
LAPTOP	HEWLETT PACKARD	OMNIBOOK XE2	TW03204580
AC ADAPTER (LAPTOP OMNIBOOK XE2)	HEWLETT PACKARD	HP F1454A	002911252
LAPTOP	HEWLETT PACKARD	OMNIBOOK XE3	TW13113065
AC ADAPTER (LAPTOP FOR OMNIBOOK XE3)	HEWLETT PACKARD	HP F1781A	01253455
RS-232-TO-RS-422/485 CONVERTER (SERIAL SERVER)	TROY GROUP, INC.	TROY 1001	N/A
AC ADAPTER (SERIAL SERVER)	POTRANS ELECTRICAL CORPORATION	WR410500500	N/A

5.3 EUT and Accessory List for RS-422 Mode

EQUIPMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER
WIRELESS SERIAL SERVER	TROY GROUP, INC.	TROY500	#7 (EUT), #8 (CF)
ETHERNET SWITCH	AIRLINK	ASW105/A3	0420A3A12982
AC ADAPTER (ETHERNET SWITCH)	GENERIC	DV-0751AS	N/A
LAPTOP	HEWLETT PACKARD	OMNIBOOK XE3	TW13113065
AC ADAPTER (LAPTOP FOR OMNIBOOK XE3)	HEWLETT PACKARD	HP F1781A	01253455
ALPHA SIGN	ADAPTIVE MICROSYSTEMS, INC.	215	86754A
AC ADAPTER (ALPHA SIGN)	GENERIC	PS573507AG	N/A

5.4 EMI Test Equipment for Brea Facility – Part 1

EQUIPMENT TYPE	MANU-FACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
Radiated Emissions Data Capture Program	Compatible Electronics	N/A	N/A	N/A	N/A
Conducted Emissions Program	Compatible Electronics	2.3 (SR19)	N/A	N/A	N/A
Spectrum Analyzer – Main Section	Hewlett Packard	8566B	3638A08768	June 24, 2004	June 24, 2005
Spectrum Analyzer – Display Section	Hewlett Packard	85662A	3701A22262	June 24, 2004	June 24, 2005
Spectrum Analyzer – Quasi-Peak Adapter	Hewlett Packard	85650A	2811A01363	June 24, 2004	June 24, 2005
EMI Test Receiver	Rohde & Schwarz	ESIB40	100172	July 22, 2003	July 22, 2005
Preamplifier	Com Power	PA-102	1017	January 6, 2004	Jan. 6, 2005
Biconical Antenna	Com Power	AB-900	15227	April 21, 2004	April 21, 2005
Log Periodic Antenna	Com Power	AL-100	16203	February 18, 2004	Feb. 18, 2005
Loop Antenna	Com Power	AL-130	25310	June 4, 2003	June 4, 2005
Microwave Preamplifier	Com Power	PA-122	25195	August 19, 2004	Aug. 19, 2005
Horn Antenna	Antenna Research	DRG-118/A	1053	January 16, 2004	Jan. 16, 2005
Antenna Mast	Com Power	AM-100	N/A	N/A	N/A
Turntable	Com Power	TT-100	N/A	N/A	N/A
Computer	Hewlett Packard	4530	US91912319	N/A	N/A

5.5 EMI Test Equipment for Brea Facility – Part 2

EQUIPMENT TYPE	MANU-FACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
Horn Antenna	Com Power	AH826	071957	November 5, 2003	Nov. 5, 2004
Microwave Preamplifier	Com Power	PA-840	711013	March 12, 2004	March 12, 2005
RF Peak Power Meter / Analyzer	Boonton Electronics Corp.	4500A-01-30	1282	February 23, 2004	Feb. 23, 2005
Peak Power Sensor	Boonton Electronics Corp.	57318	3723	February 23, 2004	Feb. 23, 2005

6. TEST SITE DESCRIPTION

6.1 Test Facility Description

Please refer to section 2.1 and 7.1 of this report for EMI test location.

6.2 EUT Mounting, Bonding and Grounding

The EUT was mounted on a 1.0 by 1.5 meter non-conductive table 0.8 meters above the ground plane.

The EUT was not grounded.

7. CHARACTERISTICS OF THE TRANSMITTER

7.1 Antenna Gain

The antenna gain is 1.5 dBi.

8. TEST PROCEDURES

The following sections describe the test methods and the specifications for the tests. Test results are also included in this section.

8.1 RF Emissions

8.1.1 Conducted Emissions Test

The spectrum analyzer was used as a measuring meter. The data was collected with the spectrum analyzer in the peak detect mode with the "Max Hold" feature activated. The quasi-peak was used only where indicated in the data sheets. A 10 dB attenuation pad was used for the protection of the spectrum analyzer input stage, and the offset was adjusted accordingly to read the actual data measured. The LISN output was measured using the spectrum analyzer. The output of the second LISN was terminated by a 50 ohm termination. The effective measurement bandwidth used for this test was 9 kHz.

Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The EUT was powered through the LISN, which was bonded to the ground plane. The LISN power was filtered and the filter was bonded to the ground plane. The EUT was set up with the minimum distances from any conductive surfaces as specified in ANSI C63.4: 2003. The excess power cord was wrapped in a figure eight pattern to form a bundle not exceeding 0.4 meters in length.

The conducted emissions from the EUT were maximized for operating mode as well as cable placement. The final data was collected under program control by the Compatible Electronics conducted emissions software in several overlapping sweeps by running the spectrum analyzer at a minimum scan rate of 10 seconds per octave. The final qualification data is located in Appendix E.

Test Results:

The EUT complies with the **Class B** limits of CFR Title 47, Part 15, Subpart B; and the limits of CFR Title 47, Part 15, Subpart C, Section 15.207 for conducted emissions.

8.1.2 Radiated Emissions (Spurious and Harmonics) Test

The EMI Receiver was used as a measuring meter along with the quasi-peak adapter. Amplifiers were used to increase the sensitivity of the instrument. The Com Power Preamplifier Model: PA-102 was used for frequencies from 30 MHz to 1 GHz, the Com-Power Microwave Preamplifier Model: PA-122 was used for frequencies from 1 GHz to 18 GHz, and the Com Power Microwave Preamplifier Model: PA-840 was used for frequencies from 18 GHz to 25 GHz. The spectrum analyzer was used in the peak detect mode with the "Max Hold" feature activated. In this mode, the EMI Receiver records the highest measured reading over all the sweeps.

The quasi-peak adapter was used only for those readings which are marked accordingly on the data sheets.

The frequencies above 1 GHz were averaged using the EMI Receiver's average detector.

The measurement bandwidths and transducers used for the radiated emissions test were:

FREQUENCY RANGE	EFFECTIVE MEASUREMENT BANDWIDTH	TRANSDUCER
10 kHz to 150 kHz	200 Hz	Active Loop Antenna
150 kHz to 30 MHz	9 kHz	Active Loop Antenna
30 MHz to 300 MHz	120 kHz	Biconical Antenna
300 MHz to 1 GHz	120 kHz	Log Periodic Antenna
1 GHz to 25 GHz	1 MHz	Horn Antenna

The open field test site of Compatible Electronics, Inc. was used for radiated emission testing. This test site is set up according to ANSI C63.4: 2003. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT by the Radiated Emission Manual Test software. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters (for E field radiated field strength). The gunsight method was used when measuring with the horn antenna in order to ensure accurate results.

Radiated Emissions (Spurious and Harmonics) Test (con't)

The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the ambient signal does not hide any emissions from the EUT. The EUT was tested at a 3 meter test distance to obtain final data.

Test Results:

The EUT complies with the **Class B** limits of CFR Title 47, Part 15, Subpart B; and the limits of CFR Title 47, Part 15, Subpart C, Sections 15.209 and 15.247 for conducted emissions.

8.2 6 dB and 20 dB Bandwidth

The 6 dB and 20 dB bandwidths were measured using the EMI Receiver. The bandwidth was measured using a direct connection from the RF out on the EUT. The resolution bandwidth was 100 kHz and the video bandwidth was 300 kHz.

Test Results:

The EUT complies with the relevant requirements of CFR Title 47, Part 15, Subpart C section 15.247 (a)(2).

8.3 Peak Output Power

The Peak Output Power was measured using the power meter and power sensor. The EUT was directly connected to the power sensor, which was directly connected to the power meter. The Peak Output Power was then measured

Test Results:

The EUT complies with the relevant requirements of CFR Title 47, Part 15, Subpart C section 15.247 (b)(3).

8.4 RF Antenna Conducted Test

The RF antenna conducted test was performed using the EMI Receiver. The RF antenna conducted test was measured using a direct connection from the RF out on the EUT into the input of the analyzer. The resolution bandwidth was 100 kHz, and the video bandwidth 300 kHz. The spans were wide enough to include all the harmonics and emissions that were produced by the intentional radiator.

Test Results:

The EUT complies with the relevant requirements of CFR Title 47, Part 15, Subpart C section 15.247 (c).

8.5 Spectral Density Output

The spectral density output was measured using the EMI Receiver. The spectral density output was measured using a direct connection from the RF out on the EUT into the input of the EMI Receiver. The resolution bandwidth was 3 kHz, and the video bandwidth was 10 kHz. The highest 1.5 MHz of the signal was used as the frequency span with the sweep rate being 1 second for every 3 kHz of span.

Test Results:

The EUT complies with the relevant requirements of CFR Title 47, Part 15, Subpart C section 15.247 (d).

8.6 RF Band Edges

The RF band edges were measured at the start of the restricted bands (2390 MHz and 2483.5 MHz). The readings taken were also averaged by the EMI Receiver. Data sheets are included in Appendix E, which compares the reading from the EMI Receiver to the spec limit.

Readings that were taken using the Marker Delta Method were derived as follows:

1. Set the EUT to transmit on the highest operating frequency near the edge of the restricted band. Set the EMI Receiver sweep to the edge of the restricted band and set the span wide enough to encompass the fundamental signal and the edge of the restricted band.

2. Make a radiated emissions measurement of the fundamental at 3 meters on the OATS. Maximize the level of the emission. Using MAX HOLD and Peak Search, record the highest peak and average level. (Peak: RBW = VBW = 1 MHz; AVG: RBW = 1 MHz, VBW = 10 Hz)

3. Connect a coax cable to the antenna output of the EUT and measure directly to the EMI Receiver. Use the same center frequency and span settings that were used for steps #1 and #2. Reduce the RBW to 100 kHz (this has been specified for band edge 2.4 GHz 15.247, Note: this is about 1% and 1% would probably suffice for most measurements.) Set the VBW = 1 MHz for peak, 10 Hz for AVG (identical to previous readings). Using MAX HOLD, then "Peak Search" and "Marker Delta" determine the "delta dB" from the peak of the fundamental to the maximum level within the restricted band. This dBc level is the "Delta dB" reading.

4. If the maximum level within the restricted band is within two standard BW (where a "standard" bandwidth is the bandwidth specified by ANSI C63.4: 2001 for the frequency being measured, or 1 MHz for > 1GHz) of the edge of the restricted band, measure the amount that the level of the fundamental dropped when the RBW was changed from 1 MHz to the RBW used in step 2.

5. Calculate the PEAK and Average level within the restricted band in dBuV/m using the equations below:

   For readings within two standard bandwidths of the band edge:
   Restricted band level (Peak) = Peak reference level – delta dB – BW delta dB (step #4)
   Restricted band level (AVG) = Average reference level – delta dB – BW delta dB (step #4)

   For readings that are outside the two standard bandwidths of the band edge:
   Restricted band level (Peak) = Peak reference level – delta dB
   Restricted band level (AVG) = AVG reference level – delta dB

Test Results:

The EUT complies with the relevant requirements of FCC Title 47, Part 15, Subpart C section 15.247 (c). The RF power at the restricted bands closest to the band edges at 2390 MHz and 2483.5 MHz meet the limits of section 15.209. Please see the data sheets located in Appendix E.

9. CONCLUSIONS

The Wireless Serial Server Model: TROY500 meets all of the specification limits defined in FCC Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.207, 15.209, and 15.247.

APPENDIX A

LABORATORY RECOGNITIONS

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Compatible Electronics has the following agency accreditations:

National Voluntary Laboratory Accreditation Program - Lab Code: 200528-0

Voluntary Control Council for Interference - Registration Numbers: R-983, C-1026, R-984 and C-1027

Bureau of Standards and Metrology Inspection - Reference Number: SL2-IN-E-1031

Conformity Assessment Body for the EMC Directive Under the US/EU MRA Appointed by NIST

Compatible Electronics is recognized or on file with the following agencies:

Federal Communications Commission

Industry Canada

Radio-Frequency Technologies (Competent Body)

APPENDIX B

MODIFICATIONS TO THE EUT

MODIFICATIONS TO THE EUT

The modifications listed below were made to the EUT to pass FCC Subpart B and Subpart C specifications.

All the rework described below was implemented during the test in a method that could be reproduced in all the units by the manufacturer.

No modifications were made to the EUT during the testing.

APPENDIX C

ADDITIONAL MODELS COVERED UNDER THIS REPORT

ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST	Wireless Serial Server Model: TROY500 S/N: N/A
ADDITIONAL MODELS COVERED UNDER THIS REPORT	Wireless Serial Server Model: TROY505 S/N: N/A

The TROY505 has an additional software feature called MODBUS

MODBUS is a software protocol that allows one to connect more than one serial device to the serial wired network in a master/slave configuration where each slave device is assigned a device ID number for maintaining orderly communications. The slave responds only to master queries or commands in a half-duplex mode. The data rate on the wire is the same regardless of how many serial slave devices are attached. The original unit (TROY500) was tested with data traveling in both directions in a full-duplex mode which is worse case.

APPENDIX D

DIAGRAMS, CHARTS, AND PHOTOS

FIGURE 1: CONDUCTED EMISSIONS TEST SETUP

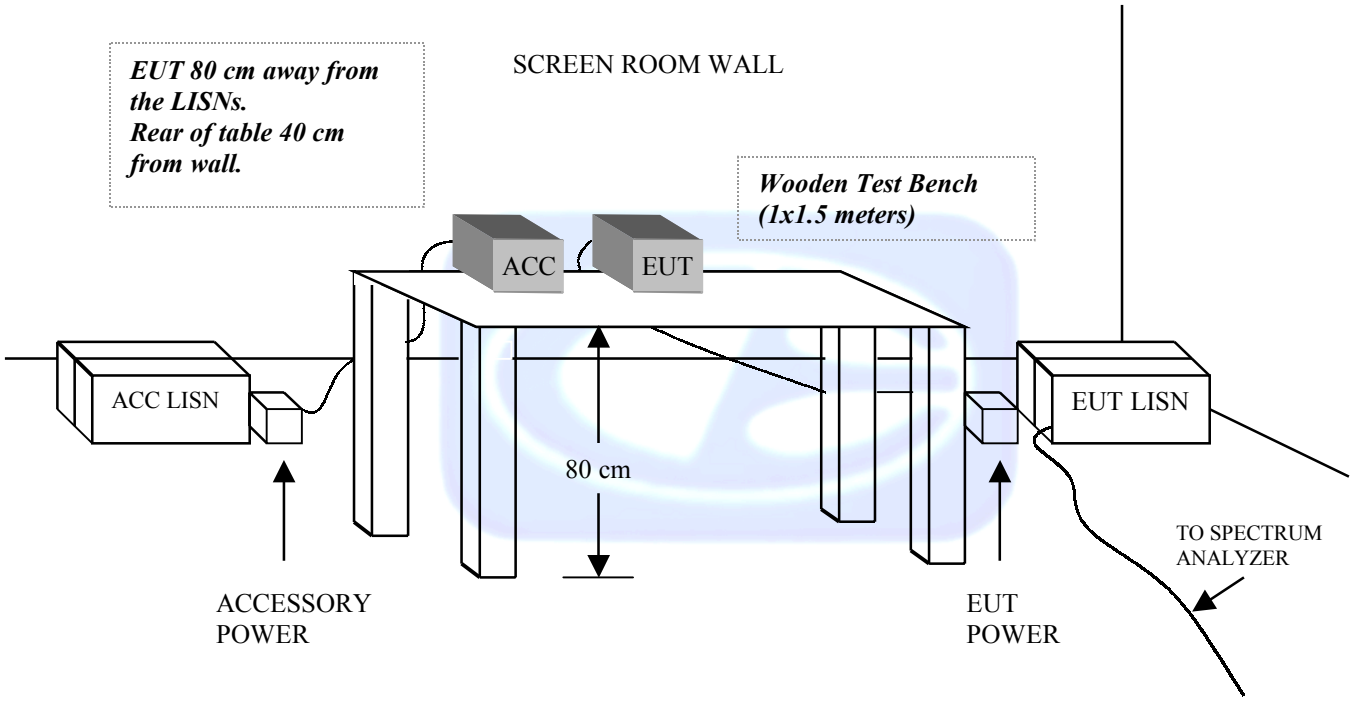
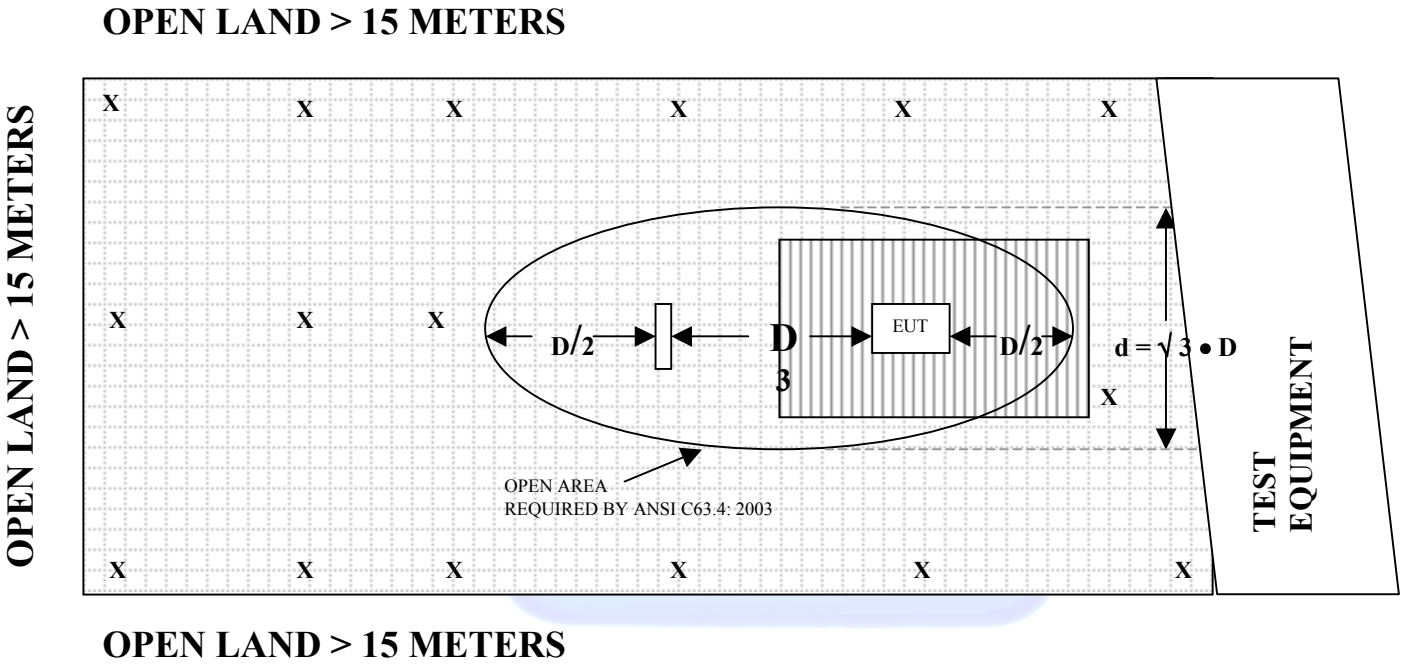


FIGURE 2: PLOT MAP AND LAYOUT OF 3 METER RADIATED SITE



COM-POWER AB-900

BICONICAL ANTENNA

S/N: 15227

CALIBRATION DATE: APRIL 21, 2004

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	11.20	120	12.50
35	10.90	125	12.90
40	11.40	140	12.40
45	8.90	150	12.10
50	11.40	160	12.40
60	10.30	175	15.80
70	8.20	180	15.70
80	6.00	200	17.40
90	7.60	250	14.60
100	10.50	300	19.50

COM-POWER AL-100

LOG PERIODIC ANTENNA

S/N: 16203

CALIBRATION DATE: FEBRUARY 18, 2004

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
300	13.00	700	19.40
400	15.10	800	21.30
500	16.70	900	20.70
600	18.70	1000	22.60

COM-POWER PA-102

PREAMPLIFIER

S/N: 1017

CALIBRATION DATE: JANUARY 6, 2004

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	37.8	300	37.6
40	37.5	350	37.5
50	37.7	400	37.5
60	37.5	450	37.0
70	37.5	500	37.1
80	37.5	550	37.3
90	37.5	600	37.1
100	37.5	650	37.4
125	37.8	700	37.1
150	37.5	750	37.1
175	37.5	800	36.8
200	37.6	850	36.2
225	37.6	900	36.7
250	37.5	950	36.2
275	37.6	1000	35.3

COM-POWER PA-122

MICROWAVE PREAMPLIFIER

S/N: 25195

CALIBRATION DATE: AUGUST 19, 2004

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	30.50	6.0	30.57
1.1	30.24	6.5	30.39
1.2	30.44	7.0	30.08
1.3	30.38	7.5	29.92
1.4	30.11	8.0	28.88
1.5	29.91	8.5	28.08
1.6	29.74	9.0	28.08
1.7	30.26	9.5	29.11
1.8	30.41	10.0	30.21
1.9	30.19	11.0	29.00
2.0	30.37	12.0	29.10
2.5	30.69	13.0	29.77
3.0	31.63	14.0	28.67
3.5	31.61	15.0	29.72
4.0	31.46	16.0	30.54
4.5	31.45	17.0	30.05
5.0	31.33	18.0	28.47
5.5	31.15		

COM-POWER PA-840

MICROWAVE PREAMPLIFIER

S/N: 711013

CALIBRATION DATE: MARCH 12, 2004

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
18.0	26.7	29.5	27.1
18.5	26.0	30.0	27.2
19.0	25.5	30.5	28.1
19.5	25.1	31.0	27.2
20.0	24.5	31.5	29.1
20.5	24.3	32.0	27.1
21.0	23.9	32.5	26.9
21.5	23.7	33.0	27.1
22.0	23.8	33.5	26.8
22.5	24.0	34.0	26.5
23.0	24.1	34.5	26.4
23.5	24.8	35.0	25.8
24.0	25.2	35.5	24.7
24.5	25.7	36.0	24.6
25.0	26.2	36.5	25.6
25.5	26.5	37.0	25.5
26.0	27.0	37.5	26.1
26.5	27.0	38.0	25.9
27.0	26.8	38.5	23.9
27.5	24.3	39.0	22.8
28.0	26.7	39.5	21.3
28.5	27.2	40.0	23.4
29.0	27.3		

ANTENNA RESEARCH DRG-118/A

HORN ANTENNA

S/N: 1053

CALIBRATION DATE: JANUARY 16, 2004

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	24.4	10.0	38.7
1.5	25.2	10.5	39.0
2.0	28.2	11.0	38.9
2.5	28.5	11.5	41.3
3.0	30.1	12.0	40.5
3.5	31.0	12.5	40.0
4.0	31.2	13.0	40.2
4.5	31.9	13.5	40.5
5.0	33.2	14.0	41.6
5.5	33.7	14.5	44.8
6.0	34.3	15.0	41.4
6.5	35.0	15.5	39.2
7.0	36.7	16.0	39.4
7.5	37.3	16.5	40.9
8.0	37.1	17.0	42.6
8.5	37.3	17.5	45.1
9.0	37.7	18.0	41.7
9.5	38.6		

COM-POWER AL-130

LOOP ANTENNA

S/N: 25310

CALIBRATION DATE: JUNE 4, 2003

FREQUENCY (MHz)	MAGNETIC (dB/m)	ELECTRIC (dB/m)
0.009	-41.2	10.3
0.01	-41.3	10.2
0.02	-42.3	9.2
0.05	-42.5	9.0
0.07	-42.3	9.2
0.1	-42.5	9.0
0.2	-44.6	6.9
0.3	-42.1	9.4
0.5	-42.4	9.1
0.7	-42.1	9.4
1	-41.5	10.0
2	-41.0	10.5
3	-41.3	10.2
4	-41.3	10.2
5	-40.9	10.6
10	-41.6	9.9
15	-42.1	9.4
20	-42.2	9.3
25	-42.7	8.8
30	-44.3	7.2

COM-POWER AH826

HORN ANTENNA

S/N: 0071957

CALIBRATION DATE: NOVEMBER 05, 2003

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
18.0	33.3	22.5	32.9
18.5	32.9	23.0	33.0
19.0	32.7	23.5	33.6
19.5	32.6	24.0	33.6
20.0	32.7	24.5	33.5
20.5	33.0	25.0	33.5
21.0	33.0	25.5	33.7
21.5	33.2	26.0	34.1
22.0	32.9	26.5	34.5

FRONT VIEW

TROY GROUP, INC.
WIRELESS SERIAL SERVER
MODEL: TROY500
FCC SUBPART B AND C – RS-232 MODE – RADIATED EMISSIONS

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

REAR VIEW

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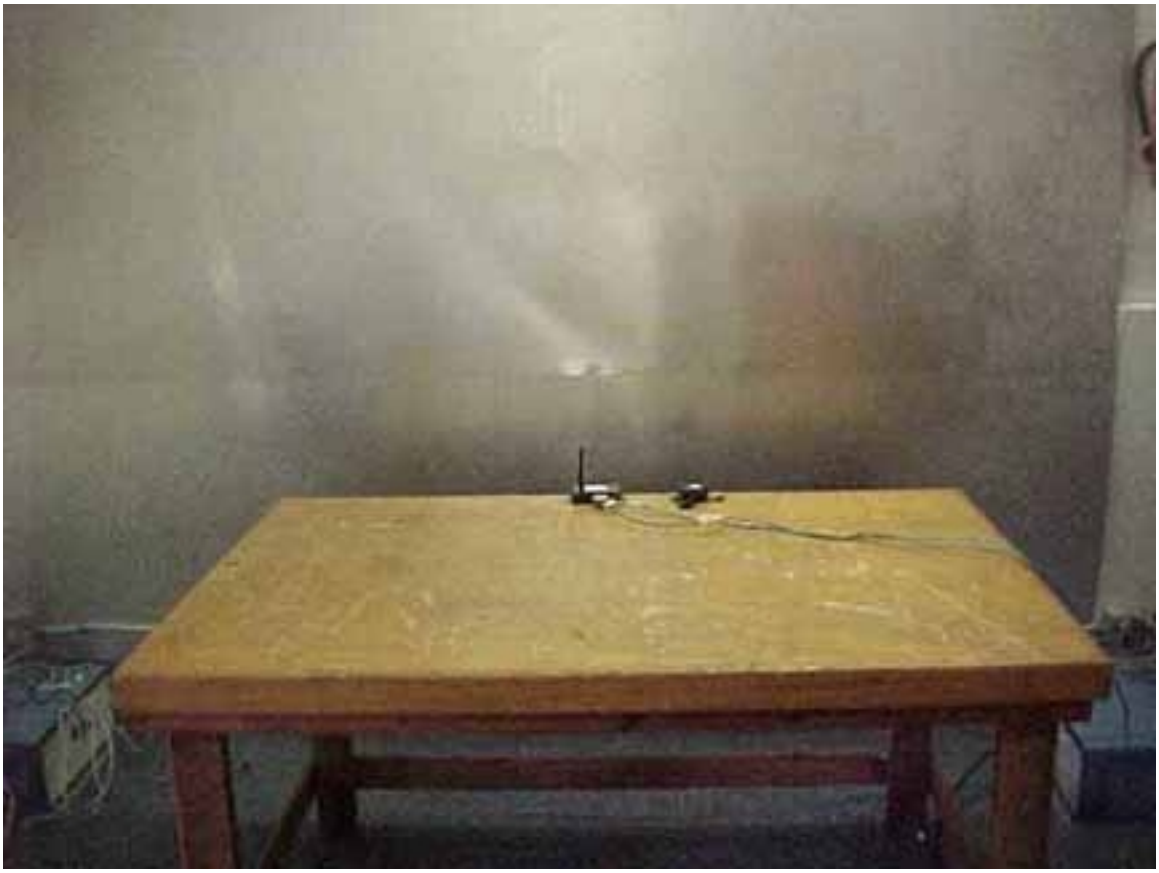

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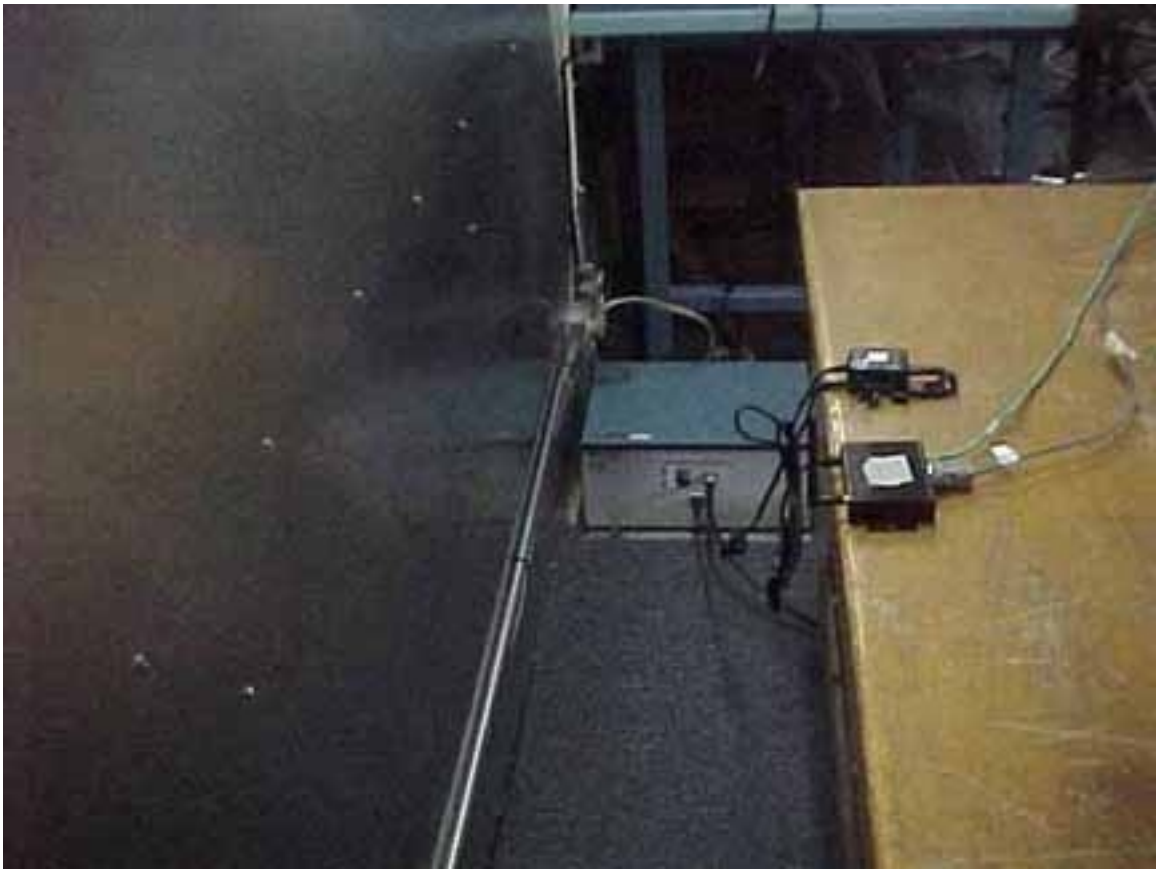

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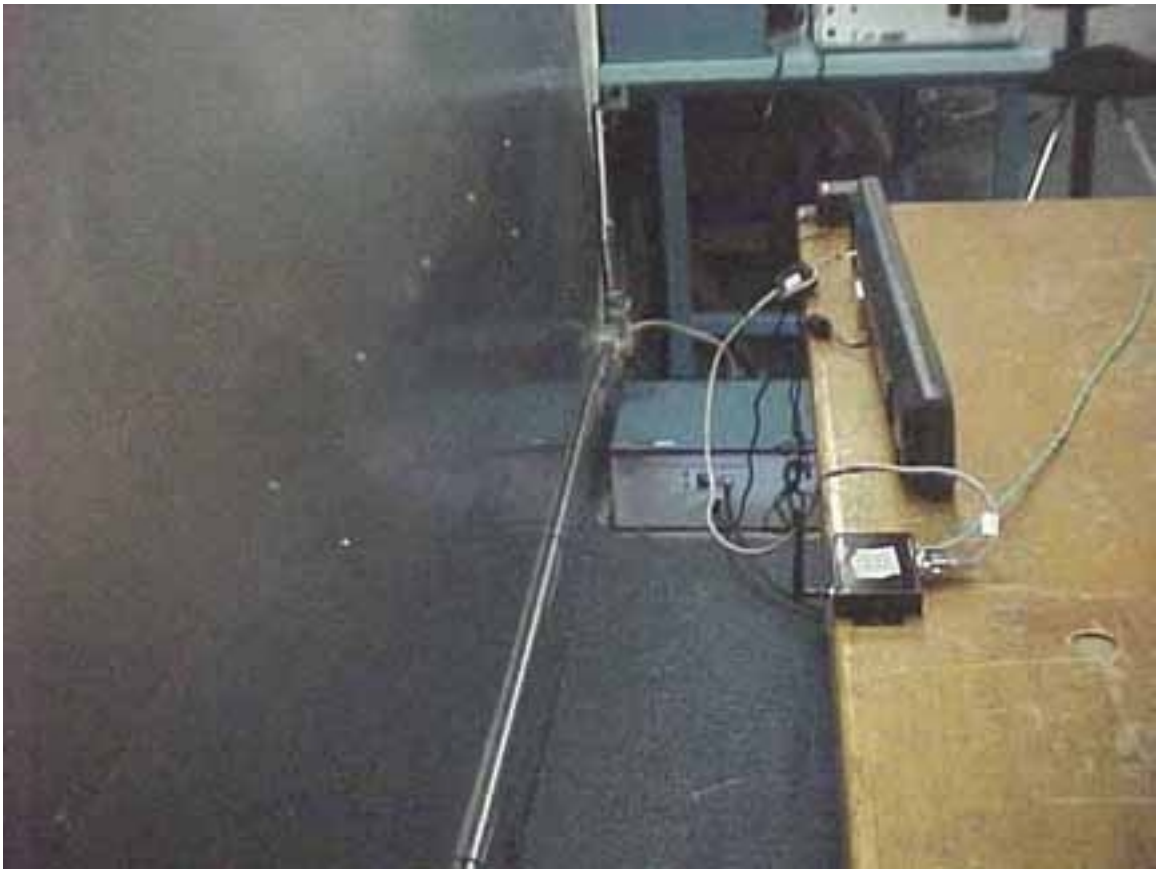

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