Emissions
Test Report

EUT Name: StatScan-CU with StatScan-Wand-WRF01

EUT Model: SD5-StatScan-WRF01

FCC Title 47, Part 15, Subpart B and C, RSS-210 Issue 5

Prepared for:

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Report/Issue Date: 29 March 2005
Report Number: 30462684.001

Statement of Compliance

Manufacturer:	Static Control Components 2515 Cox Mill Rd. Plant 8 Sanford NC 27330 919-774-3808
Requester / Applicant:	Jeff Duve
Name of Equipment:	StatScan-CU with StatScan-Wand-WRF01 Model No. SD5-StatScan-WRF01
Type of Equipment:	Information Technology Equipment (ITE)
Class of Equipment:	Class B
Application of Regulations:	FCC Title 47, Part 15, Subpart B and C, RSS-210 Issue 5
Test Dates:	15 November 2004 to 15 November 2004

Guidance Documents:

Emissions: FCC 47 CFR Part 15 and RSS-210 Issue 5

Test Methods:

Emissions: EN55022:1998 + A1:2000 + A2:2003, ANSI C63.4:2003

The electromagnetic compatibility test and documented data described in this report has been performed and recorded by TUV Rheinland of North America, in accordance with the standards and procedures listed herein. As the responsible authorized agent of the EMC laboratory, I hereby declare that a sample of one, of the equipment described above, has been shown to be compliant with the EMC requirements of the stated regulations and standards based on these results. If any special accessories and/or modifications were required for compliance, they are listed in the Executive Summary of this report.

This report must not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. This report contains data that are not covered by NVLAP accreditation. This report shall not be reproduced except in full, without the written authorization of the laboratory.

NVLAP Signatory	29 March 2005 Date

Table of Contents

1 Executive Summary

1.1 Scope

This report is intended to document the status of conformance with the requirements of the FCC Title 47, Part 15, Subpart B and C, RSS-210 Issue 5 based on the results of testing performed on *15 November* 2004 through *15 November* 2004 on the *StatScan-CU with StatScan-Wand-WRF01* Model No. *SD5-StatScan-WRF01* manufactured by Static Control Components. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

1.3 Summary of Test Results

Table 1 - Summary of Test Results

Emission	Test Method(s)	Test Parameters	Result
Radiated Emissions	47 CFR Part 15.209 and 15.225, ANSI C63.4:2003 and RSS-210 Issue 5	10 MHz to 1000 MHz, Class B	compliant
Conducted Emissions	47 CFR Part 15.207, ANSI C63.4:2003 and RSS-210 Issue 5	150 kHz to 30 MHz, Class B	compliant
Frequency Stability vs Temperature	47 CFR Part 15.207, ANSI C63.4:2003 and RSS-210 Issue 5	-20 deg. C to +50 deg. C	compliant
Bandwidth Test	47 CFR Part 15.207, ANSI C63.4:2003 and RSS-210 Issue 5		compliant

1.4 Special Accessories

No special accessories were necessary in order to achieve compliance.

1.5 Equipment Modifications

No modifications were found to be necessary in order to achieve compliance.

2 Laboratory Information

2.1 Accreditations & Endorsements

2.1.1 US Federal Communications Commission

TUV Rheinland of North America at the 762 Park Ave. Youngsville, N.C 27596 address is accredited by the commission for performing testing services for the general public on a fee basis. This laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (Registration No 90552 and 100881). The laboratory scope of accreditation includes: Title 47 CFR Part 15, 18, and 90. The accreditation is updated every 3 years.

2.1.2 NIST / NVLAP

TUV Rheinland of North America is accredited by the National Voluntary Laboratory Accreditation Program, which is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Guide 17025:1999 and ISO 9002 (Lab code 200094-0). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

2.1.3 Japan - VCCI

The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) is a group that consists of Information Technology Equipment (ITE) manufacturers and EMC test laboratories. The purpose of the Council is to take voluntary control measures against electromagnetic interference from Information Technology Equipment, and thereby contribute to the development of a socially beneficial and responsible state of affairs in the realm of Information Technology Equipment in Japan. TUV Rheinland of North America at the 762 Park Ave. Youngsville, N.C 27596 address has been assessed and approved in accordance with the Regulations for Voluntary Control Measures. (Registration No. R-1174, R-1679, C-1790 and C-1791).

2.1.4 Acceptance By Mutual Recognition Arrangement

The United States has an established agreement with specific countries under the Asia Pacific Laboratory Accreditation Corporation (APLAC) Mutual Recognition Arrangement. Under this agreement, all TUV Rheinland of North America at the 762 Park Ave. Youngsville, N.C 27596 address test results and test reports within the scope of the laboratory NIST / NVLAP accreditation will be accepted by each member country.

2.2 Test Facilities

All of the test facilities are located at 762 Park Ave., Youngsville, North Carolina 27596, USA.

2.2.1 Emission Test Facility

The Open Area Test Site and AC Line Conducted measurement facility used to collect the radiated and conducted data has been constructed in accordance with ANSI C63.7:1992. The site has been measured in accordance with and verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4:1992, at a test distance of 3 and 10 meters. This site has been described in reports dated May 12, 1997, submitted to the FCC, and accepted by letter dated June 25, 1997 (31040/SIT 1300F2).

The site is listed with the FCC and accredited by NVLAP (code 200094-0). The 5m semi-anechoic chamber used to collect the radiated data has been verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4:1992, at a test distance of 3 meters. A report detailing this site can be obtained from TUV Rheinland of North America.

2.2.2 Immunity Test Facility

ESD, EFT, Surge, PQF: These tests are performed in an environmentally controlled room with a 3.7m x 3.7m x 3.175mm thick aluminum floor connected to PE ground. For ESD testing, tabletop equipment is placed on an insulated mat with a surface resistivity of 10^9 Ohms/square on a 1.6m x 0.8m x 0.8m high non-conductive table with a 3.175mm aluminum top (Horizontal Coupling Plane). The HCP is connected to the main ground plane via a low impedance ground strap through two 470 kΩ resistors. The Vertical Coupling Plane consists of an aluminum plate 50cm x 50cm x 3.175mm thick. The VCP is connected to the main ground plane via a low impedance ground strap through two 470 kΩ resistors. For each of the other tests, the HCP is removed.

RF Field Immunity testing is performed in a 7.3m x 3.7m x 3.2m anechoic chamber.

RF Conducted and Magnetic Field Immunity testing is performed on a 4.9m x 3.7m x 3.175mm thick aluminum ground plane which is connected to one end of the anechoic chamber.

All test areas allow a minimum distance of 1 meter from the EUT to walls or conducting objects.

2.3 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1st addition, 1995.

The Combined Standard Uncertainty is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities, equal to the positive square root of a sum of terms, the terms being the variances or co-variances of these other quantities weighted according to how the measurement result varies with changes in these quantities. The term standard uncertainty is the result of a measurement expressed as a standard deviation.

The Expanded Uncertainty defines an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand. The fraction may be viewed as the coverage probability or level of confidence of the interval.

The test system for conducted emissions is defined as the LISN, spectrum analyzer, coaxial cables, and pads. The test system for radiated emissions is defined as the antenna, spectrum analyzer, pre-amplifier, coaxial cables, and pads. The conducted test system has a combined standard uncertainty of ± 1.2 dB. The radiated test system has a combined standard uncertainty of ± 1.6 dB. The expanded uncertainty at a level of 95% confidence is obtained by multiplying the combined standard uncertainty by a coverage factor of 2. Compliance criteria are not based on measurement uncertainty.

2.4 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Guide 17025:1999.

3 Product Information

Figure 1 – Photo of EUT

3.1 Product Description

The information for all equipment used in the tested system, including: descriptions of cables, clock and microprocessor frequencies, EMI critical components, and accessory equipment has been supplied by the manufacturer and is listed in the EMC Test Plan found in Section 6.

3.2 Equipment Configuration

A description and justification of the equipment configuration is given in the EMC Test Plan. The EUT was tested as described in the EMC Test Plan and was configured and operated in a manner consistent with its intended use. The EUT was connected to rated power and allowed to warm up to normal operating conditions. The placement of the EUT system components was guided by the test standard and selected to represent typical installation conditions.

In the case of an EUT that can operate in more than one configuration, preliminary testing was performed to determine the configuration that produced maximum radiation.

The final configuration was selected to produce worse case radiation and place the EUT in the most susceptible state. There were no deviations from the description of the Equipment Configuration given in the EMC Test Plan.

3.3 Operation Mode

A description and justification of the operation mode is given in the EMC Test Plan.

In the case of an EUT that can operate in more than one state, preliminary testing was performed to determine the operating mode that produced maximum radiation.

The final operating mode was selected to produce worse case radiation and place the EUT in the most susceptible state. There were no deviations from the description of the Operation Mode given in the EMC Test Plan.

4 Emissions

4.1 Radiated Emissions

Testing was performed in accordance with 47 CFR Part 15.209 and 15.225, ANSI C63.4:2003 and RSS-210 Issue 5. These test methods are listed under the laboratory's NVLAP Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices.

4.1.1 Test Methodology

4.1.1.1 Preliminary Test

A test program that controls instrumentation and data logging was used to automate the preliminary RF emission test procedure. The frequency range of interest was divided into sub-ranges to yield a frequency resolution of approximately 300 kHz and provide a reading at each frequency for no more than 12° of turntable rotation. For each frequency sub-range the turntable was rotated 360° while peak emission data was recorded and plotted over the frequency range of interest in horizontal and vertical antenna polarization's.

Preliminary emission profile testing was performed inside the anechoic chamber. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm above the floor. The EUT was positioned as shown in the setup photographs. The receiving antenna was placed at a distance of 3m at a fixed height of 1m. Measurement equipment was located outside of the chamber. A video camera was placed inside the chamber to view the EUT.

4.1.1.2 Final Test

For each frequency measured, the peak emission was maximized by manipulating the receiving antenna from 1 to 4 meters above the ground plane and placing it at the position that produced the maximum signal strength reading. The turntable was then rotated through 360° while observing the peak signal and placing the EUT at the position that produced maximum radiation. The six highest emissions relative to the limit were measured unless such emissions were more than 20 dB below the limit. If less than six emissions are within 20 dB of the limit, than the noise level of the receiver is measured at frequencies where emissions are expected. Multiples of all oscillator and microprocessor frequencies were also checked.

Final testing was performed on an NSA compliant test site. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane. The placement of EUT and cables were the same as for preliminary testing and is shown in the setup photographs.

4.1.1.3 Deviations

There were no deviations from this test methodology.

4.1.2 Test Results

Section 4.1.2.1 lists the final measurement data under the worst case operating modes, configurations, and/or cable positions. It also reflects the results including any modifications and/or special accessories listed in Sections 1.4 and 1.5.

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

4.1.2.1 Final Data

The data recorded in this section contains the final results under the worst-case conditions and with any modifications or special accessories implemented as the manufacturer intends.

SOP 1 Radiated Emissions

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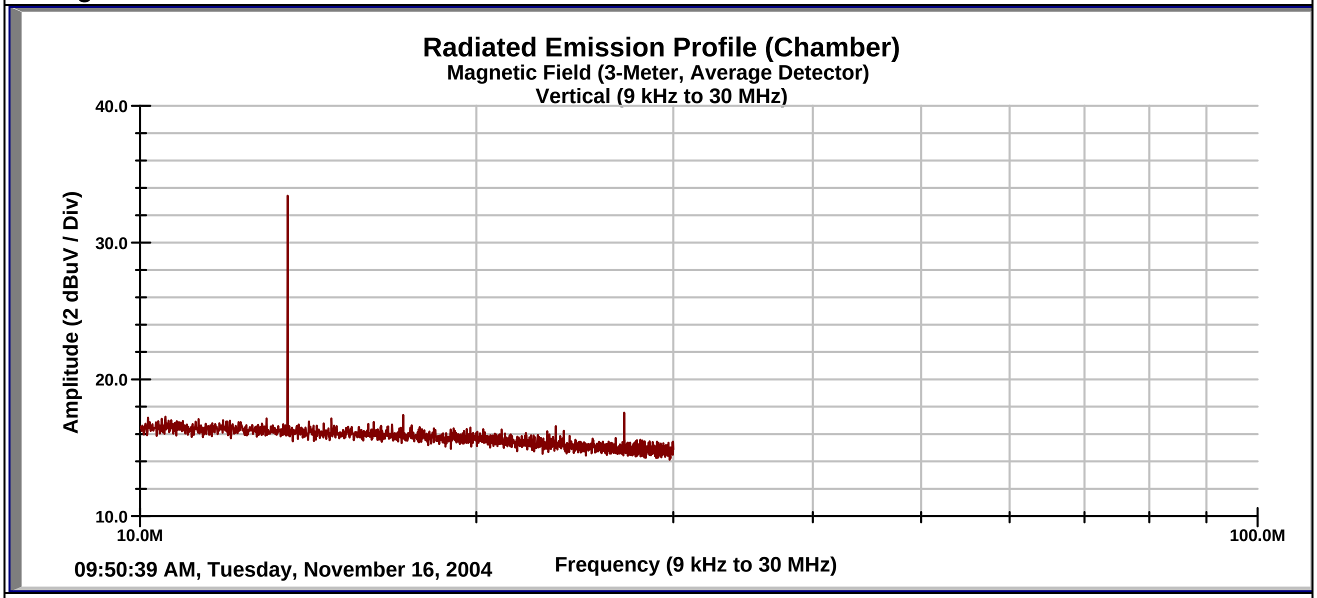
EUT Name	StatScan-CU with StatScan-Wand-WRF01	**Date**	15 November 2004
EUT Model	SD5-StatScan-WRF01	**Temp / Hum in**	71 Deg. F / 29% RH
EUT Serial	None	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15 and RSS-210 Issue 5	**Line AC / Freq.**	120 VAC / 60 Hz
		RBW / VBW	9 KHz / 30 KHz
Dist/Ant Used	3M / 6502	**Performed by**	Eugene Moses
Configuration	Stat Scan with RF Wand. See notes.		



Emission Freq (MHz)	ANT Polar	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
All measurements were made using a Quasi-peak detector. See Notes.										
13.56	Loop	1	350	33.0	0.00	0.28	10.47	43.75	124.00	-80.25
27.12	Loop	1	213	11.77	0.00	0.40	9.29	21.46	69.54	-48.08

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: Above measurements were made at a distance of 3 meters. The final values were extrapolated using the square of the inverse linear distance method, (40dB/decade). This in accordance with FCC Part 15.31(f)(2) Testing was performed in the 3 orthogonal planes to determine worse case.

SOP 1 Radiated Emissions

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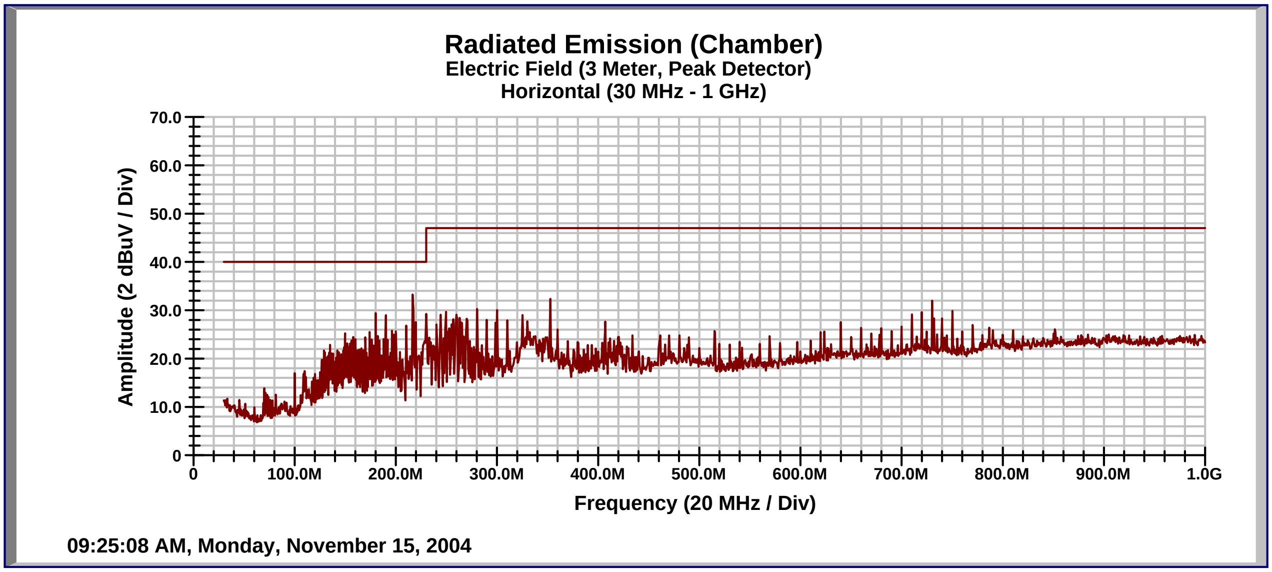
EUT Name	StatScan-CU with StatScan-Wand-WRF01	**Date**	15 November 2004
EUT Model	SD5-StatScan-WRF01	**Temp / Hum in**	71 Deg. F / 29% RH
EUT Serial	None	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15 and RSS-210 Issue 5	**Line AC / Freq.**	120 VAC / 60 Hz
		RBW / VBW	120 KHz / 300 KHz
Dist/Ant Used	3M / 3110B , SAS-516	**Performed by**	Eugene Moses
Configuration	Stat Scan with RF Wand.		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
All measurements were made using a Quasi-peak detector.										
180.00	H	1.70	93	14.62	0.00	1.06	13.50	29.18	40.00	-10.82
189.80	H	1.69	266	12.40	0.00	1.08	14.51	27.99	40.00	-12.01
190.00	H	1.69	266	14.33	0.00	1.08	14.54	29.96	40.00	-10.04
217.00	H	1	211	21.42	0.00	1.15	11.50	34.07	40.00	-5.93
230.00	H	1.38	259	16.76	0.00	1.20	11.50	29.46	40.00	-10.54
352.60	H	1	236	15.37	0.00	1.50	15.35	32.21	47.00	-14.79
730.00	H	1	158	8.84	0.00	2.20	21.20	32.24	47.00	-14.76

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: Testing was performed in the 3 orthogonal planes to determine worse case.

SOP 1 Radiated Emissions

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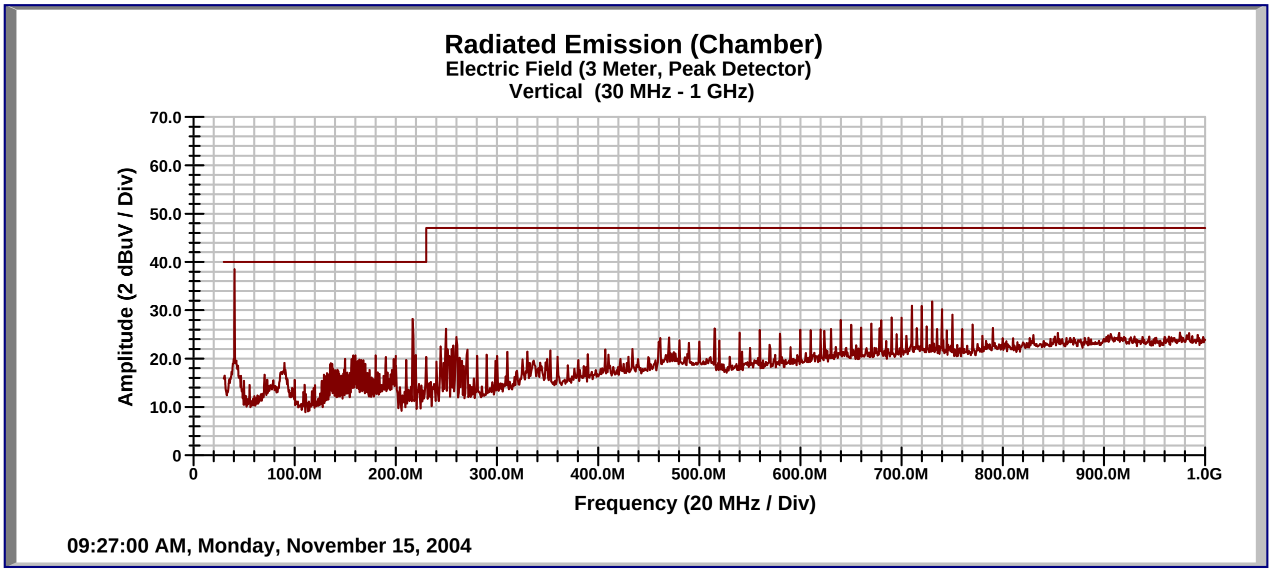
EUT Name	StatScan-CU with StatScan-Wand-WRF01	**Date**	15 November 2004
EUT Model	SD5-StatScan-WRF01	**Temp / Hum in**	71 Deg. F / 29% RH
EUT Serial	None	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15 and RSS-210 Issue 5	**Line AC / Freq.**	120 VAC / 60 Hz
		RBW / VBW	120 KHz / 300 KHz
Dist/Ant Used	3M / 3110B, SAS-516	**Performed by**	Eugene Moses
Configuration	Stat Scan with RF Wand.		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
All measurements were made using a Quasi-peak detector.										
40.68	V	1	213	23.57	0.00	0.48	10.56	34.61	40.00	-5.39
216.90	V	1	99	14.64	0.00	1.15	11.11	26.91	40.00	-13.09
250.00	V	1	291	12.37	0.00	1.25	12.10	25.73	47.00	-21.27
730.00	V	1	242	8.93	0.00	2.20	20.10	31.23	47.00	-15.77

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: Testing was performed in the 3 orthogonal planes to determine worse case.

4.1.3 Photos

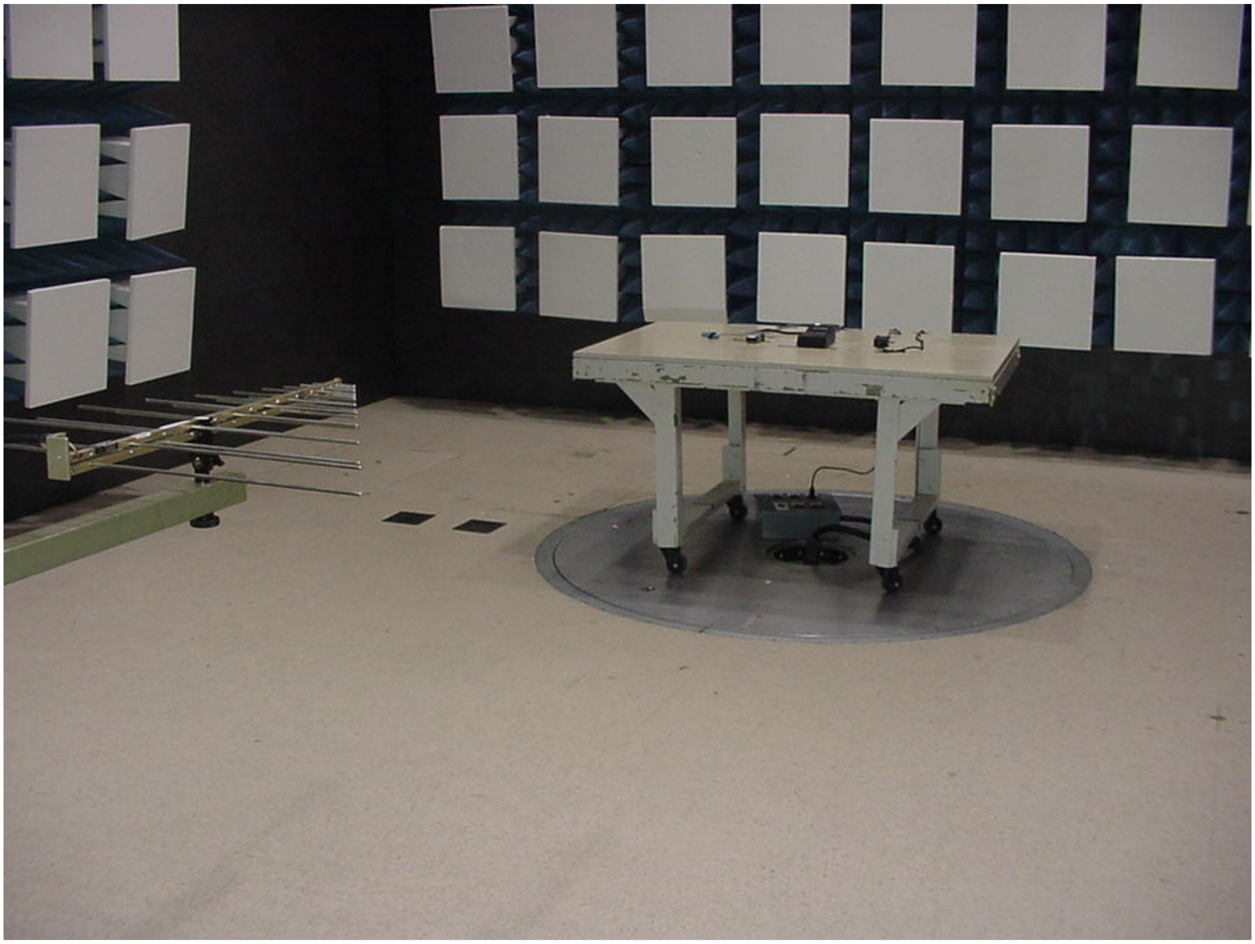


Figure 2 - Radiated Emissions Test Setup (Chamber - Front)

Figure 3 - Radiated Emissions Test Setup (Chamber – Back)

4.1.4 Sample Calculation

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength (dBμV/m) = FIM - AMP + CBL + ACF

Where: FIM = Field Intensity Meter (dBμV)
AMP = Amplifier Gain (dB)
CBL = Cable Loss (dB)
ACF = Antenna Correction Factor (dB/m)

$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

4.2 Conducted Emissions

Testing was performed in accordance with 47 CFR Part 15.207, ANSI C63.4:2003 and RSS-210 Issue 5. These test methods are listed under the laboratory's NVLAP Scope of Accreditation.

This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices.

4.2.1 Test Methodology

A test program that controls instrumentation and data logging was used to automate the AC Power Line Conducted emission test procedure. The frequency range of interest was divided into sub-ranges such as to yield a frequency resolution of 9 kHz. For each frequency sub-range, each phase and neutral of the AC power line were measured with respect to ground. Measurements were performed using a set of 50µH / 50Ω LISNs.

Testing is either performed in the anechoic chamber or on PLC Site 2. The setup photographs clearly identify which site was used. The vertical ground plane used in the anechoic chamber is a 2m x 2m wooden frame that is covered with ¼ inch hardware cloth and is bonded to the horizontal ground plane.

In the case of tabletop equipment, the EUT is placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane and 40cm from a vertical ground reference plane. The rear of the EUT was positioned flush with the backside of the table and directly over the LISNs. The power and I/O cables were routed over the edge of the table and bundled approximately 40cm from the ground plane. Support equipment was powered from a separate LISN. Floor-standing equipment is placed directly on the ground plane.

4.2.1.1 Deviations

There were no deviations from this test methodology.

4.2.2 Test Results

Section 4.2.2.1 lists the final measurement data under the worst case operating modes, configurations, and/or cable positions. It also reflects the results including any modifications and/or special accessories listed in Sections 1.4 and 1.5.

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Plots of the EUT's AC Line Conducted emissions are contained in the following sections. The plots show peak and/or average emissions and the corresponding peak and/or average limits. If the peak emissions are below the average limit, then the EUT is considered to pass and no average measurements are made. If the peak emissions are below the quasi-peak limit and the average emissions are below the average limit, then the EUT is considered to pass and no further measurements are made. Otherwise, individual frequencies are measured and compared to the corresponding limit for the detector used (quasi-peak or average).

4.2.2.1 Final Data

The data recorded in this section contains the final results under the worst-case conditions and with any modifications or special accessories implemented as the manufacturer intends.

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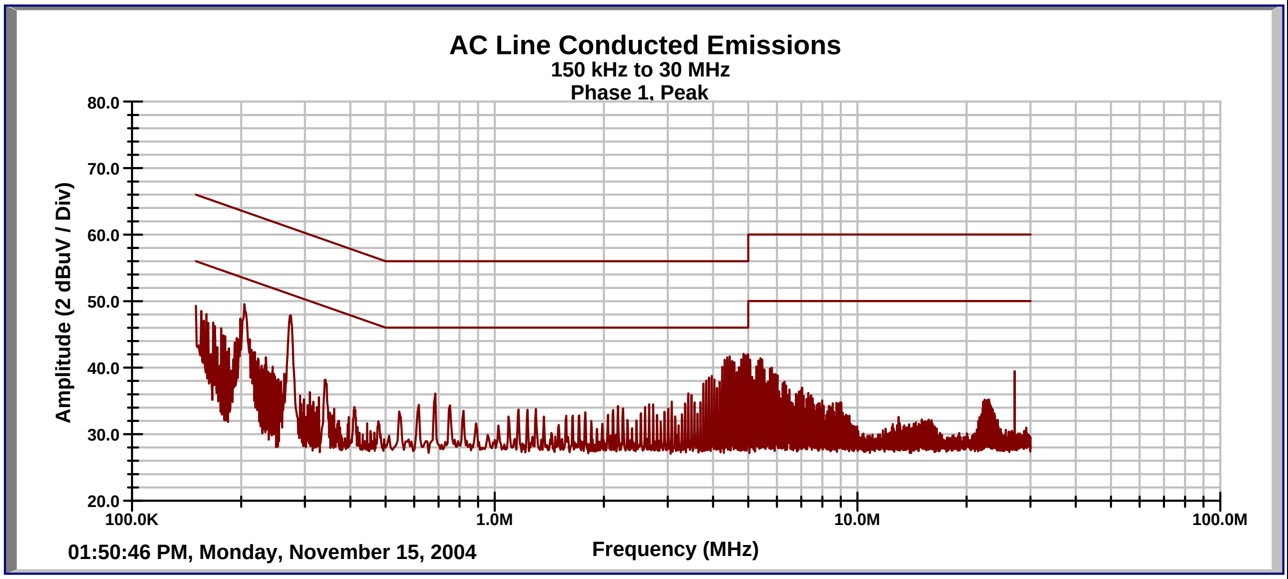
EUT Name	StatScan-CU with StatScan-Wand-WRF01	**Date**	15 November 2004
EUT Model	SD5-StatScan-WRF01	**Temperature**	71 Deg. F
EUT Serial	None	**Humidity**	29% RH
Standard	FCC 47 CFR Part 15 and RSS-210 Issue 5	**Line AC /Freq**	120 VAC / 60 Hz
LISNs Used	5, 6	**Performed by**	Eugene Moses
Configuration	Stat Scan with RF Wand.		



Emission Freq (MHz)	Line ID (1,2,3,N)	FIM Quasi (dBuV)	FIM Ave (dBuV)	Cable Loss (dB)	LISN + T Limiter (dB)	Quasi Limit (dBuV)	Ave Limit (dBuV)	Quasi Spec Margin (dB)	Ave Spec Margin (dB)
0.21	1	36.31	27.65	0.02	10.06	63.21	53.21	-16.81	-15.47
0.27	1	36.38	31.70	0.03	10.06	61.12	51.12	-14.65	-9.33
4.86	1	30.75	29.48	0.09	10.17	56.00	46.00	-14.99	-6.26

Quasi Spec Margin = Quasi FIM + Cable Loss + LISN CF - Quasi Limit ± Uncertainty
Ave Spec Margin = Ave FIM + Cable Loss + LISN CF - Ave Limit ± Uncertainty

Combined Standard Uncertainty $u_c(y) = \pm 1.2$dB Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence

Notes:

SOP 2 Conducted Emissions

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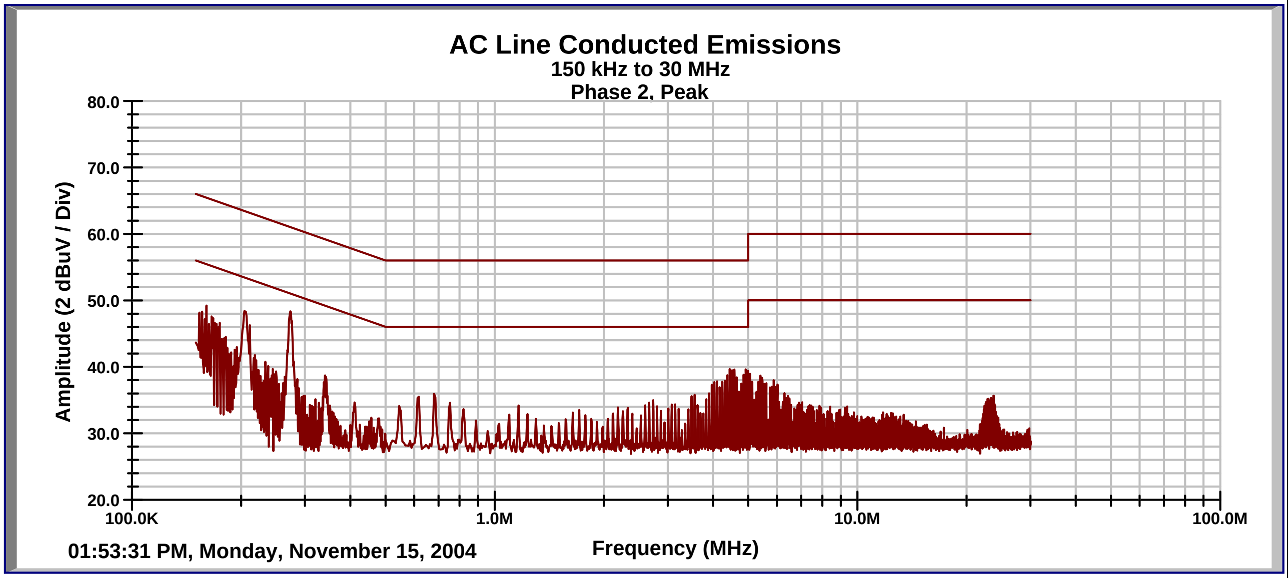
EUT Name	StatScan-CU with StatScan-Wand-WRF01	**Date**	15 November 2004
EUT Model	SD5-StatScan-WRF01	**Temperature**	71 Deg. F
EUT Serial	None	**Humidity**	29% RH
Standard	FCC 47 CFR Part 15 and RSS-210 Issue 5	**Line AC /Freq**	120 VAC / 60 Hz
LISNs Used	5, 6	**Performed by**	Eugene Moses
Configuration	Stat Scan with RF Wand.		



Emission Freq (MHz)	Line ID (1,2,3,N)	FIM Quasi (dBuV)	FIM Ave (dBuV)	Cable Loss (dB)	LISN + T Limiter (dB)	Quasi Limit (dBuV)	Ave Limit (dBuV)	Quasi Spec Margin (dB)	Ave Spec Margin (dB)
0.21	2	36.58	28.69	0.02	10.04	63.21	53.21	-16.56	-14.45
0.27	2	37.03	33.25	0.03	10.04	61.12	51.12	-14.02	-7.80
4.45	2	27.97	26.64	0.08	10.13	56.00	46.00	-17.82	-9.15

Quasi Spec Margin = Quasi FIM + Cable Loss + LISN CF - Quasi Limit ± Uncertainty
Ave Spec Margin = Ave FIM + Cable Loss + LISN CF - Ave Limit ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.2dB   Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes:

4.2.3 Photos

Figure 4 - Conducted Emissions Test Setup (Front)

4.2.4 Sample Calculation

The signal strength is calculated by adding the LISN Correction Factor and Cable Loss to the measured reading. The basic equation is as follows:

Field Strength (dBμV/m) = FIM + CBL + LCF

Where: FIM = Field Intensity Meter (dBμV)
CBL = Cable Loss (dB)
LCF = LISN Loss (dB)

$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

4.3 Measurement of Frequency Stability Versus Temperature

Testing was performed in accordance with 47 CFR Part 15.207 Subpart C, ANSI C63.4:2003 and RSS-210 Issue 5. This test measures the stability of the carrier signal during temperature changes.

4.3.1 Test Methodology

The EUT is placed in an environmental temperature test chamber, supplied with the normal operating voltage, with an antenna attached to the output port, if applicable. If the antenna is an adjustable length antenna, it will be fully extended. A monitoring device (Spectrum analyzer) is then attached to a receive antenna placed 15 cm away from the EUT via coaxial cable.

The temperature inside the chamber is then raised to the highest temperature specified and allowed sufficient time for the temperature of the chamber to stabilize. While maintaining a constant temperature inside the environmental chamber, the carrier signal is then measured at startup, and one, two, three, four, five, six, seven, eight, nine, and ten minutes after startup. Then the above process is repeated for the lowest temperature specified and 10 degree Centigrade increments between the extremes thereafter.

4.3.1.1 Deviations

There were no deviations from this test methodology.

4.3.2 Test Results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Temp. Deg. C	Frequency (in MHZ) measured in six minute intervals											Greatest Deviation
	Startup	1	2	3	4	5	6	7	8	9	10	
-20	13.5610	13.5610	13.5610	13.5609	13.5609	13.5608	13.5608	13.5607	13.5607	13.5606	13.5606	0.0029 %
-10	13.5606	13.5610	13.5610	13.5610	13.5609	13.5609	13.5603	13.5600	13.5600	13.5600	13.5600	0.0044 %
0	13.5600	13.5600	13.5608	13.5608	13.5610	13.5610	13.5610	13.5610	13.5610	13.5610	13.5610	0.0074 %
+10	13.5610	13.5610	13.5610	13.5610	13.5610	13.5609	13.5609	13.5609	13.5609	13.5609	13.5609	0.0007 %
+20	13.5609	13.5609	13.5610	13.5610	13.5610	13.5610	13.5610	13.5610	13.5610	13.5610	13.5610	0.0007 %
+30	13.5610	13.5610	13.5610	13.5612	13.5612	13.5613	13.5613	13.5613	13.5613	13.5613	13.5613	0.0022 %
+40	13.5613	13.5613	13.5611	13.5608	13.5608	13.5606	13.5604	13.5601	13.5601	13.5601	13.5601	0.0088 %
+50	13.5601	13.5601	13.5601	13.5603	13.5604	13.5605	13.5605	13.5605	13.5605	13.5605	13.5605	0.0029 %

Note: Operating Voltage = 121.51 VAC, Frequency = 60 Hz, RBW = 10 KHz, VBW = 100 KHz, Span = 50 KHz, Sweep Time = 30 mS

Temp Deg C	Fc with operating voltage: 121.51 VAC			Fc with operating voltage – 15%: 103.28 VAC			Fc with operating voltage + 15%: 139.74 VAC		
	-20 dB	Center	+20 dB	-20 dB	Center	+20 dB	-20 dB	Center	+20 dB
20.0	13.54175	13.5610	13.57858	13.5420	13.56075	13.57838	13.5420	13.56038	13.57813

4.4 Bandwidth Test for Band Edge Compliance

This test measures the bandwidth of the fundamental frequency of an intentional radiator.

However, since the fundamental power is lower than the limits in 15.209, this test was not performed.

5 Test Equipment Use List

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal dd/mm/yy	Next Cal dd/mm/yy
SOP 1 - Radiated Emissions (5 Meter Chamber)					
Antenna Loop	EMCO	6502	3336	19-Jan-04	19-Jan-05
Ant. Biconical	EMCO	3110B	3367	4-Feb-04	4-Feb-05
Ant. Log Periodic	AH Systems	SAS-516	133	19-Jan-04	19-Jan-05
Antenna Horn	EMCO	3115	2236	14-Oct-04	14-Oct-05
Cable, Coax	Andrew	FSJ1-50A	042	15-Jan-04	15-Jan-05
Cable, Coax	Andrew	FSJ1-50A	045	15-Jan-04	15-Jan-05
Chamber, Semi-Anechoic	Braden Shielding	5 meter	A67631	27-Jan-04	27-Jan-05
Data Table, EMCWin	TUV Rheinland	EMCWin.dll	002	6-Jan-02	6-Jan-06
Spectrum Analyzer	Agilent Tec.	E7405A	US39440157	11-Aug-04	11-Aug-05

SOP 2 - Conducted Emissions (AC/DC and Signal I/O)					
Cable, Coax	Belden	RG-213	004	19-Jan-04	19-Jan-05
LISN (5) 50mH/50Ω	Solar Electronics	8028-50-TS-24	990441	6-Aug-04	6-Aug-05
LISN (6) 50mH/50Ω	Solar Electronics	8028-50-TS-24	990442	6-Aug-04	6-Aug-05
LISN Selection Box	TUV Rheinland	CFL-9206	1650	11-May-04	11-May-05
Spectrum Analyzer	Agilent Tec.	E7405A	US39440161	11-Aug-04	11-Aug-05

General Laboratory Equipment					
Meter, Multi	Fluke	79-3	69200606	6-Aug-04	6-Aug-05
Meter, Temp/Humid/Barom	Fisher	02-400	01	13-Aug-04	13-Aug-05
Power Supply, AC	California Instruments	1251P	L06429	CNR II	CNR II

- Calibration of equipment past due for re-calibration will be performed expeditiously. If any equipment is found to be out of tolerance at that time, affected customers will be notified accordingly.

6 EMC Test Plan

The attached EMC test plan has been generated by the manufacturer and implemented as recorded in this test report.

7 Introduction

This manufacturer-supplied document provides a description of the Equipment Under Test (EUT), configuration(s), operating condition(s), and performance acceptance criteria. It is intended to provide the test laboratory with the essential information needed to perform the requested testing.

8 Customer

The information in the following tables is required, as it should appear in the final test report.

Table 2 – Manufacturer Information

Company Name:	Static Control Components, Inc.
Street Address:	PO Box 152
City, State, Zip Code:	Sanford, NC 27331
Tel:	919-774-3808
Fax:	919-774-1287

Table 3 – Technical Contact Information

Contact Name	Telephone	Fax	Email address
Lyn Burchette	919-774-3808	919-774-1287	lynb@scc-inc.com
Jeff Duve	919-774-3808	919-774-1287	jeffd@scc-inc.com
Skip London	919-774-3808	919-774-1287	skipl@scc-inc.com

9 Equipment Under Test (EUT)

The information provided in the following table should be listed as it should appear in the final report. For those products that have only a model name, list the model number as *non-applicable* and vice-versa.

Table 4 – EUT Designation

Model Name:	STATSCAN-WRF01
Model Number:	

9.1 Technical Description

Please provide a general description and composition of the EUT. Include what the EUT is designed to do; chassis type and dimensions, modules, boards, subassemblies, marketed configuration.

Please provide a paragraph or two regarding the general description of the EUT. The information provided here is generally satisfied by the marketing literature describing the overall function(s), operation(s), and/or feature(s) of the EUT. It is intended to be read by a relatively non-technical individual and provides the rationale for performing the test(s) on the EUT.
Product Description:

The EUT is a peripheral for the StatScan system that is used to read, analyze and reset various RF based smart tags. Smart tags are devices which consists of some type of non-volatile memory, (memory which does not change when power is removed), control logic, some type of rudimentary power supply and some interface devices all placed in a small package. Examples of these tags can be found as security tags found on point of sale merchandise to use and authenticity tags found in printer cartridges. To reduce cost as well as save the environment, the StatScan has been designed to recycle various types of tags by resetting/re-initializing these smart tags.

The EUT is designated as the STATSCAN-WRF01. It is referenced in the user manual as a Wand and is utilized on 13.56MHz smart tags. The RF Wand contains a communications buffer, an RF Processor, a 27.120MHz oscillator, RF Analog circuitry and an antenna.

The StatScan-CU will be utilized as a host for the EUT. Special test firmware has been written to facilitate ease of testing of the EUT. The firmware that will be shipped with the StatScan system is a menu driven user interface, which significantly limits the communications traffic between the host and EUT due to information presented to the user. The special firmware bypasses the user interface, increasing the communications traffic to 2~3 times per second. The circuitry supporting the user interface is still active, however the responses from the interface are ignored, therefore the test firmware will maximize emissions beyond normal operational bounds thus testing the worst possible operational case.

9.2 Configuration(s)

The standards require that the EUT be tested in a "typical" configuration such that the EUT will be set up in a manner consistent with its intended use. Where several configurations are possible, each should be investigated and the worst case tested. In the case of multiple accessory external ports, at least one external accessory, simulator, or cable must be connected to each type of port.

Equipment should be clearly marked as one of the following types (In the case of rack mount equipment, it must be specified whether the equipment will be tested as rack or table top.):

- Table Top as per ANSI C63.4 2003 and EN55022 1998. The Control Unit, Target Pod and power supply will be placed within 0.25 m of each other with the integral four foot connecting cable hanging between the table and the ground plane.

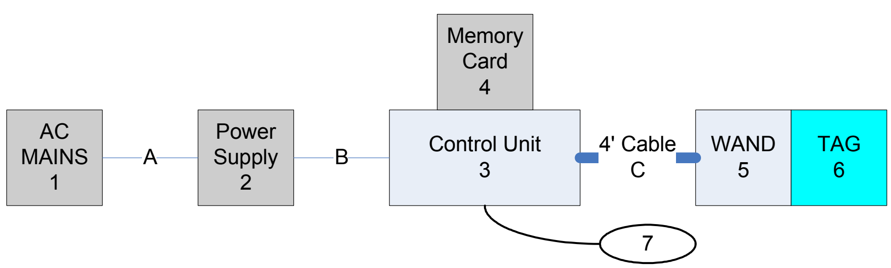


Figure 5 - Block Diagram of EUT Set-Up

The block diagram should show a rectangle for every box, chassis, or peripheral. Be sure to clearly label which box/chassis is the EUT. If a box/chassis contains the EUT (e.g. printed circuit board) then the box/chassis should be marked as the EUT Host. Each rectangle should be connected with lines representing the cables connecting them. Each rectangle/chassis should be labeled with a number (e.g. “1”, “2”, etc.) and each line/cable should be labeled with a letter (e.g. “A”, “B”, etc.). Be sure to include power cables. These designators should match those of the tables below, where more details regarding the rectangles/chassis and lines/cables should be provided. *Any ferrites on the cables need to be shown in the block diagram*.

Table 5 – Equipment Chassis Shown in Block Diagram

Des.	Manufacturer	Model No.	Rev	Serial No.	Description
1	AC Mains Input				AC Mains Input
2	Elpac Power Systems	FW1824			+24V Power Supply
3	Static Control Components	StatScan-CU			Control Unit
5	Static Control Components	STATSCAN-WRF01			RF Wand
6	HP/Cannon	RH4-5419			RF Based Tag
7	Static Control Components	WBB-AFWS121M			Adj. Wrist Strap

The cable length will determine whether particular immunity tests are applicable. The length recorded must be the length provided to the lab for testing. The cable provided should be the longest one provided to the end user or the longest one available for purchase. In the event that the manufacturer of the EUT does not provide the cables, "representative" cables must be provided. *Any ferrites on the cables need to be shown in the block diagram*.

The cable length required from the EUT located inside the anechoic chamber to the support equipment located in the accessory chamber is approximately 20 ft.

Table 6 – Cables Shown in Block Diagram

Des.	Cable Function	Notes	Type of Cable (Data or Power)	Shielded or Unshielded	Length (m)
A	Mains Power Supply	IEC320 C14 Grounded	Power	Unshielded	~1.5
B	DC Power Supply	Integral to Power Supply	Power	Unshielded	~1.5
C	Wand Cable	Custom Cable	Power/Data	Shielded	1.2~1.4

In addition to the information provided in Table 5 for each rectangle/chassis shown in the block diagram, the details of each subassembly (power supply, hard drives, modules, etc.) must be provided below. The designators (Des.) relate each of these subassemblies to the chassis it is contained in.

Table 7 – Subassemblies within each Chassis

Des.	Manufacturer	Model No.	Revision	Serial No.	Description
4	SimpleTech				32MB MMC Memory Card

9.3 Operating Conditions

The standards require that the EUT be tested in a "typical" operating mode consistent with its intended use. Where several operating modes are possible, each should be investigated and the worst case tested. The operating mode should be defined in terms of how the equipment is operating and why it is operating that way. Within the possible modes of operation, the one selected for testing should represent the one that would produce highest emissions. For RF Immunity testing, please state the time required to complete one operation cycle.

9.3.1 Software

List the software used to operate the EUT. This may be firmware, an operating system, and/or an exercise program. Where applicable, list the software revision.

The STATSCAN-WRF01 Wand does not contain any software or firmware. The StatScan Control Unit contains factory-installed firmware that cannot be updated by the customer. Special test firmware has been written to facilitate ease of testing of the EUT. The firmware that will be shipped with the StatScan system is a menu driven user interface, which significantly limits the communications traffic between the host and EUT due to information presented to the user. The special firmware bypasses the user interface, increasing the communications traffic to 2~3 times per second. The circuitry supporting the user interface is still active, however the responses from the interface are ignored, therefore the test firmware will maximize emissions beyond normal operational bounds thus testing the worst possible operational case.

9.3.2 Mode(s)

Provide instructions for setting up the EUT in each operating mode to be investigated.

Attach tag (6) to Wand (5) via electrical tape. Connect the Wand (5) to the Control Unit (3) with custom cable(C). Insert Memory Card (4) into Control Unit (3). Plug in Power Supply (2) via cable (B) into Control Unit (3). Apply AC Power to Power Supply (2) via Cable (A).

The control unit is to be placed in the center with the Wand on the Left and the Power Supply on the right with their cables hanging out the back. This configuration allows for the cable to exit straight out of the back of the unit.

The control unit will be pre-loaded with special test software to facilitate testing. Once power is applied, the EUT should communicate with the tag, which is indicated by blinking Yellow-Green LEDs on the back of the Wand. Should the Wand blink Red-Yellow, reposition the tag until it blinks Yellow-Green.

9.4 Performance Criteria (Required for Immunity Testing Only)

Please state the manufacturer’s performance criteria against which compliance will be assessed. For each mode listed above, be sure to include the parameters (e.g. “The front panel LEDs shall remain lit”, “The CRT shall continue to display the data”, “The motor shall continue to operate”, etc.) that the test operator will observe to determine whether or not the EUT is functioning properly.

In many instances, the above information should be provided for every port (e.g. Ethernet, RS-232, USB, S-Video, etc.).

9.4.1 Generic Performance Criteria “A”

The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

9.4.2 Manufacturer Specific Performance Criteria “A”

9.4.3 Generic Performance Criteria "B"

The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

9.4.4 Manufacturer Specific Performance Criteria "B"

9.5 Power Requirements

Describe the input power requirements and power connections of the EUT. Please specify whether or not the EUT requires AC or DC. If special receptacles or physical connections are required, please note them in this section.

Table 8 - Power Requirements

Parameter	Value
Input Voltage	90~264VAC
Input Frequency	47~63Hz
Input Current (rated)	0~1A
1ϕ, 3ϕ, or DC	1ϕ
Plug Type	IEC320 C14

9.6 Oscillator / Microprocessor Frequencies

Please record all oscillator frequencies used in the EUT. This is required for immunity testing (each frequency is dwelled upon during Radiated Immunity) and extremely helpful for mitigation during Radiated Emissions.

Table 9 - Oscillator Frequency List

Frequency (MHz)	Description of Use
27.120	Primary Clock for Wand

10 Equivalent Models

List any product(s) you wish to have evaluated as being "identical" to the equipment that was tested. Common reasons for models being equivalent are:

- Firmware limits configurations (worst case having been tested)
- Printed Circuit Board Options (worst case configurations were determined and supported by test data resulting in non-tested options being allowed for sale)
- Multiple chassis (worst case having been tested)
- Marketing (same model is marketed under different names)

Table 10 - Models Equivalent to EUT

Model	Reason for Equivalence
SWAND-1	Marketing name for STATSCAN-WRF01

10.1 Methods of Determining Equivalence

Either of the following methods can be used for including a list of equivalent models into the laboratory test report.

10.1.1 Manufacturer's Letter of Attestation

The manufacturer can provide a Letter of Attestation to the laboratory stating that the model(s) listed are equivalent to the one(s) tested. The laboratory will include this list in its final test report with the following statement:

> The manufacturer has provided this list of equivalent models and has been included in this report for the convenience of the customer. The laboratory has *not* performed an evaluation of these models and makes no statement regarding the validity of the list.

10.1.2 Laboratory Evaluation

The manufacturer can present the laboratory with a list of equivalent model(s) and the reason(s) why each model is equivalent to the one(s) tested. The laboratory will evaluate each model on the list and determine whether it is equivalent or not. Model(s) determined to be equivalent can be listed in the report with the following statement:

> The laboratory has performed an evaluation of this list of equivalent models and states that the test data contained within this report applies to the compliance of these models with the standards tested to. This statement is based on a test sample of one unit.