



KTL Dallas, Inc.
Safety - EMC - Telecom - ISO Guide 25

ENGINEERING TEST REPORT

**ON
MODEL: NT 132 / 315 READER**

IN ACCORDANCE WITH:

CFR 47, PART 15, SUBPART B, CLASS A & SUBPART C

REPORT NO.: 8L0012EUS

TESTED FOR:
AXCESS, INC.
3208 COMMANDER DRIVE
CARROLLTON, TEXAS 75006

TESTED BY:
KTL DALLAS, INC.
802 N. KEALY
LEWISVILLE, TEXAS 75057-3136



NVLAP LAB CODE: 100426-0

AUGUST 1999

This document contains 37 pages including this one.

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This report applies only to the item/s tested and does not constitute endorsement by the United States of America.

EQUIPMENT: NT 132 / 315 READER

The equipment has been tested by KTL Dallas, Inc. for verification of compliance with CFR 47, Part 15, Subpart B for Class A requirements for Digital Devices. Each unit manufactured, imported or marketed will conform to the sample(s) tested within the variations that can be expected due to quantity production and testing on a statistical basis.

BY: _____
SIGNATURE PRINTED

TITLE:

COMPANY:

Axcess, Inc.
3208 Commander Drive
Carrollton, Texas 75006

DATE:

EQUIPMENT: NT 132 / 315 READER

Section 1. Summary of Test Results

General:

All measurements are traceable to national standards.

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with CFR 47, Part 15, Subpart B, for Class A Digital Devices, Paragraph Numbers 15.107 and 15.109 & Subpart C, Paragraph Numbers 15.207, 15.209 and 15.231.

The equipment was tested for conducted emissions from 0.45 MHz to 30 MHz using a 50 μ h line impedance stabilization network (L.I.S.N.) as described in ANSI C63.4-1992. Peripheral equipment was also operated through a 50 μ h L.I.S.N.

The equipment was tested for radiated emissions from 30 MHz to 1000 MHz with extension to the 10th harmonic of any fundamental clock frequency in accordance with the requirements of CFR 47, Part 15, Subpart B for Class A Digital Devices and Subpart C. Frequencies were initially identified in a large shielded room. Amplitude measurements were made on an outdoor Open Area Test Site. Details of the outdoor site are on file with the FCC.

These tests were conducted using measurement procedures of ANSI C63.4-1992.

Abstract (Subpart B):

Name Of Test	Paragraph No.	Results
Conducted Emissions	15.107	Complies
Radiated Emissions	15.109	Complies

Abstract (Subpart C):

Name Of Test	Paragraph No.	Results
Conducted Emissions	15.207	Complies
Radiated Emissions	15.209	Complies

EQUIPMENT: NT 132 / 315 READER

In the configuration tested, the E.U.T. complies with the requirements of CFR 47, Part 15, Subpart B, for Class A Digital Devices, Paragraph Numbers 15.107 and 15.109 & Subpart C, Paragraph Numbers 15.207, 15.209 and 15.231.

THIS REPORT APPLIES ONLY TO THE ITEM(S) TESTED AND DOES NOT
CONSTITUTE ENDORSEMENT BY THE UNITED STATES OF AMERICA.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE
TEST SPECIFICATIONS HAVE BEEN MADE: **NONE.**

NVLAP LAB CODE: 100426-0

TESTED BY: Mike Sundstrom DATE: 05/06/99
Mike Sundstrom, Senior EMC Technician

APPROVED BY: Dale L. Reynolds, EMC Division Manager DATE: _____

EQUIPMENT: NT 132 / 315 READER

Section 2. Equipment Under Test (E.U.T.)

Manufacturer: Axxess, Inc.

Model No.: NT 132 / 315 Reader

Serial No.: 0101099017



Production Unit



Pre-Production Unit

The E.U.T. was received on March 23, 1999, in good condition.

Description of E.U.T.:

The E.U.T. is a metal, NEMA Enclosure with PCB's and wall mount power supply. The E.U.T. is used to receive information transmitted to and from the TAG and decode and utilize it for security purposes.

Clock, Oscillator, Highest Frequencies Utilized:

- (1) 5 MHz
- (2) 132 kHz (RX)
- (3) 315 MHz (TX)

EQUIPMENT: NT 132 / 315 READER

E.U.T. Photographs:



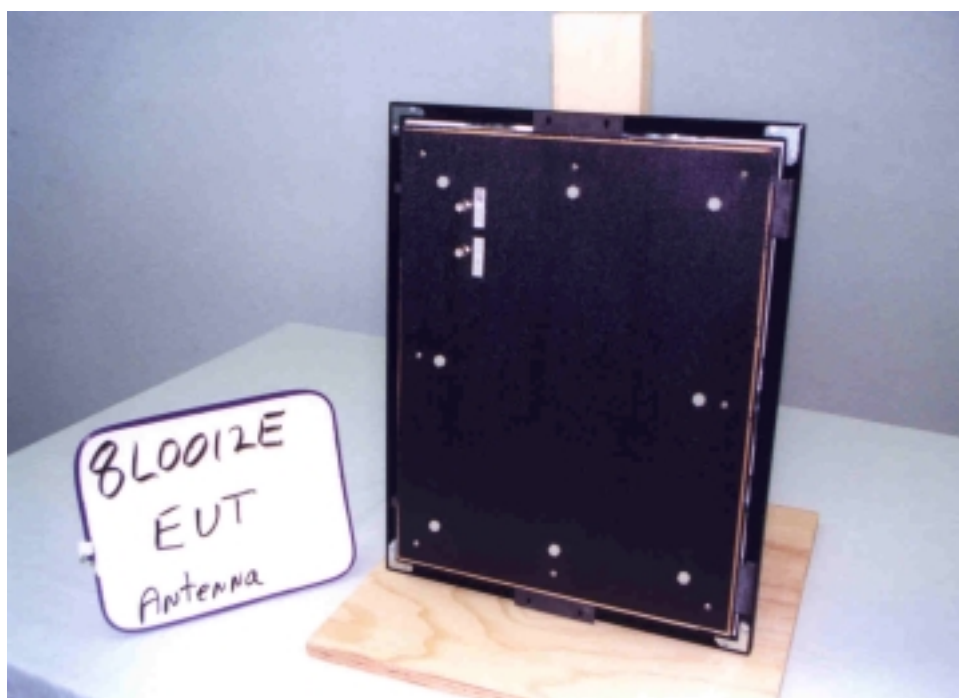
EQUIPMENT: NT 132 / 315 READER

E.U.T. Photographs (Continued):



EQUIPMENT: NT 132 / 315 READER

E.U.T. Photographs (Continued):



EQUIPMENT: NT 132 / 315 READER

Modifications Incorporated in E.U.T.:

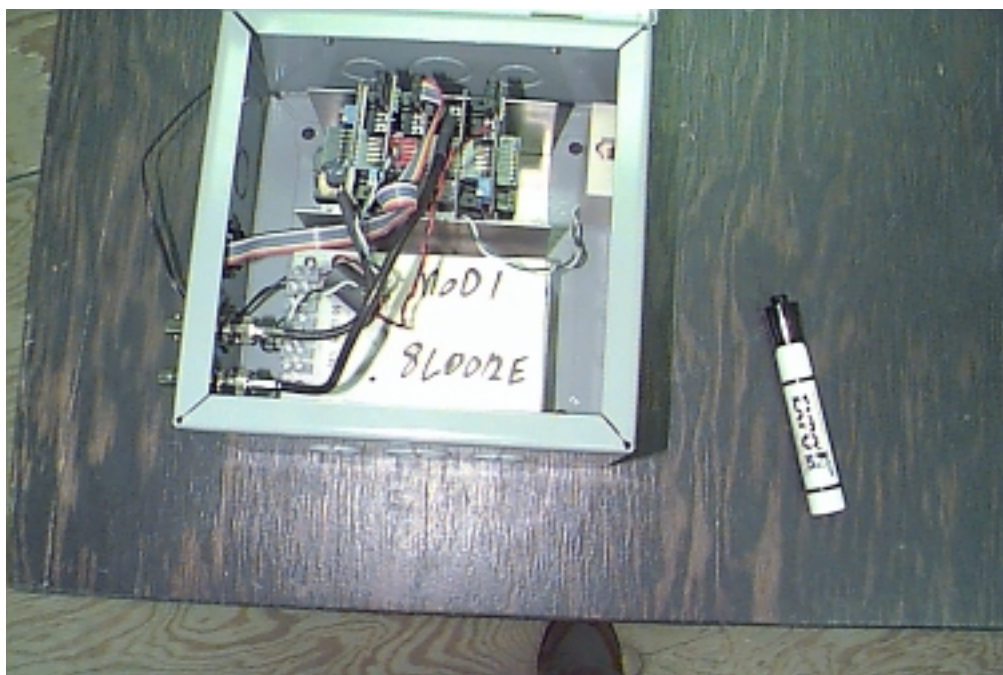
To achieve compliance the following change(s) were made by KTL Dallas, Inc. and Axxcess Inc. during compliance testing:

MOD 1: A ferrite was added, (Fair Rite P/N 2643665702 torroid) to the DC power line (common mode) reader box.

EQUIPMENT: NT 132 / 315 READER

Modification Photo:

MOD. 1:



EQUIPMENT: NT 132 / 315 READER

Justification:

The E.U.T. was configured for testing as per typical installation. Position and bundling of cables were investigated to establish maximum amplitude of emissions.

The following combinations were investigated to establish worst case configuration:

- (1) On, no Tag (Reader TX off).
- (2) On, with Tag (Reader TX on).

Exercise Program:

The E.U.T. exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to typical use.

Exercise Mode:

- (1) Normal operation, Tag outside reader effect field (Transmit mode, Receiver idle).
Known as "No Tag".
- (2) Normal operation, Tag within reader effect field (Transceiver mode, TX – RX active).
Known as "With Tag".

EQUIPMENT: NT 132 / 315 READER

Section 3. Equipment Configuration

Equipment Configuration List:

Item	Manufacturer	Description	FCC ID:	Model No.	Serial No.
(A)	Axcess, Inc.	Tag	None	Neurotag 3.1	36273
(B)*	Axcess, Inc.	Reader	None	NT 132 / 315 Reader	0101099017
(C)*	Axcess, Inc.	Antenna Tuning Unit	None	ATU	None
(D)*	International Importers	Transformer	None	24 V @ 500 mV	None
(E)*	Axcess, Inc.	Antenna Picture Frame	None	Picture Frame	None

*E.U.T.

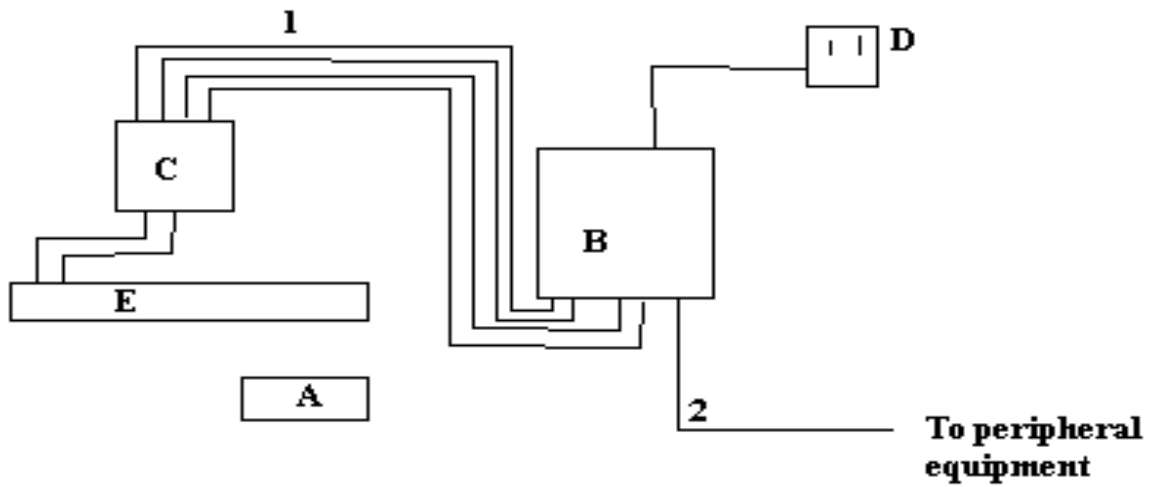
Inter-connection Cables:

Item	Description	Model No. / Manufacturer	Connectors	Length (m)	Shielded	
					Yes	No
(1)	Coax (Qty.: 2)	RG58/U / Axcess, Inc.	BNC	1.7	X	
(2)	Serial	128-06 / Unknown	DB9	7.6		X

NOTE: Please see block diagram on the following page.

EQUIPMENT: NT 132 / 315 READER

Configuration of the Equipment Under Test (E.U.T.):



EQUIPMENT: NT 132 / 315 READER

Section 4. Notes

EQUIPMENT: NT 132 / 315 READER

Section 5. Conducted Emissions

TESTED BY: Mike Sundstrom	DATE OF TESTS: 03/23/99
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Test Conditions:

Test Voltage: 115 Vac @ 60 Hz

Temperature: 20°C

Humidity: 65%

Purpose:

The tests are intended to demonstrate the compliance of the Equipment Under Test (E.U.T.) to the limits for conducted emissions as defined by CFR 47, Part 15, Subpart B, for Class A Digital Devices, Paragraph Number 15.107 and Subpart C, Paragraph Number 15.207.

Test Results:

The E.U.T. complies.

Test # CE 1A (CFR 47, Part 15, Subpart B, Class A, Paragraph Number 15.107):

The worst case emission is 45 dB μ V at 0.45 MHz on the L1 side of the line. This is 15 dB below the quasi-peak specification limit of 60 dB μ V.

Test # CE 1 (CFR 47, Part 15, Subpart C, Paragraph Number 15.207):

The worst case emission is 45 dB μ V at 0.45 MHz on the Hot (L1) side of the line. This is 3 dB below the quasi-peak specification limit of 48 dB μ V.

Measurement Data:

See test data on pages 17 and 18.

EQUIPMENT: NT 132 / 315 READER

Specification Limits:**CFR 47, Subpart B, 15.107:**

Frequency(MHz)	Maximum Powerline Conducted RF Voltage	
	μV	$\text{dB}\mu\text{V}$
0.45-1.705	1000	60.0
1.705-30.0	3000	69.5

CFR 47, Subpart C, 15.207:

Frequency(MHz)	Maximum Powerline Conducted RF Voltage	
	μV	$\text{dB}\mu\text{V}$
0.45-30.0	250	48

Method of Measurement (Procedure ANSI C63.4-1992):

Measurements were made using a spectrum analyzer with 10 kHz RBW, CISPR Quasi-Peak detector.

Broadband emissions are identified by switching the receiver detector function from Quasi-Peak to Average. If the amplitude of the emission drops by 6 dB or more then the emission is classified as broadband and the Quasi-Peak level is reduced by a factor of 13 dB.

EQUIPMENT: NT 132 / 315 READER

Test Data – Conducted Emissions Test # CE 1A (Subpart B):

Conducted Emissions Data (CISPR Quasi-Peak Detector) FCC (CFR 47)							
Complete	<u> X </u>						
Preliminary	<u> </u>						
		Page <u> 1 </u> of <u> 1 </u>					
Client: <u> Axxcess </u>		W.O.#: <u> 8L0012E </u>		Date: <u> 03/23/99 </u>			
EUT: <u> NT 132 / 315 Reader </u>		S/N: <u> 0101099017 </u>		Specification: <u> CFR 47,15,B(15.107(b)) </u>			
Tech: <u> M.Sundstrom </u>		Test #: <u> CE 1A </u>		Lab: <u> 2 </u>		Photo ID: <u> 8L0012 CE 1A </u>	
Equipment Used: <u> 215,c30,g1707,c24,g1501,g2619,099 </u>							
Configuration: <u> On with no tag </u>							
IF Bandwidth: <u> 10kHz </u>		Video Bandwidth <u> 10kHz </u>		Detector: <u> </u> Peak <u> x </u> CISPR			
Ambient Temperature: <u> 20 </u> C		EUT Power: <u> X </u> 115 V.A.C.		<u> X </u> 60 Hz		<u> X </u> 1 Phase	
Relative Humidity: <u> 65 </u> %		<u> </u> 230 V.A.C.		<u> </u> 50 Hz		<u> </u> 3 Phase	
Atmospheric Pressure: <u> 990 </u> mbar		<u> </u> Other <u> </u>					

Freq. (MHz)	Meter Reading (dBuV)	Attn. (dB)	Cable Loss (dB)	Probe Factor (dB)	Corrected Reading (dBuV)	Spec.limit (dBuV)	Pol.	Comments:
0.45	14	30	0	0	44	60	L0	
0.5	12	30	0	0	42	60	L0	
3.68	10	20	0	0	30	69.5	L0	
4.078	13	20	0	0	33	69.5	L0	
4.34	13	20	0	0	33	69.5	L0	
4.867	14	20	0	0	34	69.5	L0	
10	15	20	0	0	35	69.5	L0	
10.262	16	20	0	0	36	69.5	L0	
10.393	17	20	0	0	37	69.5	L0	
10.656	19	20	0	0	39	69.5	L0	
10.92	20	20	0	0	40	69.5	L0	
11.2	11	30	0	0	41	69.5	L0	
11.446	11	30	0	0	41	69.5	L0	
18.95	13	30	0	0	43	69.5	L0	
19.21	14	30	0	0	44	69.5	L0	
0.45	15	30	0	0	45	60	L1	
10	16	20	0	0	36	69.5	L1	
10.79	17	20	0	0	37	69.5	L1	
10.92	19	20	0	0	39	69.5	L1	
18.95	19	20	0	0	39	69.5	L1	
19.2	19	20	0	0	39	69.5	L1	
								Scanned 0.45MHz to 30MHz

EQUIPMENT: NT 132 / 315 READER

Test Data – Conducted Emissions Test # CE 1 (Subpart C):

Conducted Emissions Data (CISPR Quasi-Peak Detector) FCC (CFR 47)								
Complete	<u> X </u>							
Preliminary	<u> </u>							
		Page <u> 1 </u> of <u> 1 </u>						
Client: <u> Axxcess </u>		W.O.#: <u> 8L0012E </u>		Date: <u> 03/23/99 </u>				
EUT: <u> NT 132 / 315 Reader </u>		S/N: <u> 0101099017 </u>		Specification: <u> CFR 47,15,C(15.207) </u>				
Tech: <u> M.Sundstrom </u>		Test #: <u> CE 1 </u>		Lab: <u> 2 </u>		Photo ID: <u> 8L0012 CE 1 </u>		
Equipment Used: <u> 215,c30,g1707,c24,g1501,g2619,099 </u>								
Configuration: <u> On with no tag </u>								
IF Bandwidth: <u> 10kHz </u>		Video Bandwidth <u> 10kHz </u>		Detector: <u> </u> Peak <u> x </u> CISPR				
Ambient Temperature: <u> 20 </u> C		EUT Power: <u> X </u> 115 V.A.C.		<u> X </u> 60 Hz		<u> X </u> 1 Phase		
Relative Humidity: <u> 65 </u> %		<u> </u> 230 V.A.C.		<u> </u> 50 Hz		<u> </u> 3 Phase		
Atmospheric Pressure: <u> 990 </u> mbar		<u> </u> Other <u> </u>						
Freq. (MHz)	Meter Reading (dBuV)	Attn. (dB)	Cable Loss (dB)	Probe Factor (dB)	Corrected Reading (dBuV)	Spec.limit (dBuV)	Pol.	Comments:
0.45	14	30	0	0	44	48	L0	
0.5	12	30	0	0	42	48	L0	
3.68	10	20	0	0	30	48	L0	
4.078	13	20	0	0	33	48	L0	
4.34	13	20	0	0	33	48	L0	
4.867	14	20	0	0	34	48	L0	
10	15	20	0	0	35	48	L0	
10.262	16	20	0	0	36	48	L0	
10.393	17	20	0	0	37	48	L0	
10.656	19	20	0	0	39	48	L0	
10.92	20	20	0	0	40	48	L0	
11.2	11	30	0	0	41	48	L0	
11.446	11	30	0	0	41	48	L0	
18.95	13	30	0	0	43	48	L0	
19.21	14	30	0	0	44	48	L0	
0.45	15	30	0	0	45	48	L1	
10	16	20	0	0	36	48	L1	
10.79	17	20	0	0	37	48	L1	
10.92	19	20	0	0	39	48	L1	
18.95	19	20	0	0	39	48	L1	
19.2	19	20	0	0	39	48	L1	
Scanned 0.45MHz to 30MHz								

EQUIPMENT: NT 132 / 315 READER

Conducted Emissions Photographs for Test # CE 1A (Subpart B) and Test # CE 1 (Subpart C):

FRONT VIEW:



SIDE VIEW:



The test setup for Test # CE 1A was identical to the test setup in Test # CE 1.

EQUIPMENT: NT 132 / 315 READER

Section 6. Radiated Emissions

TESTED BY: Mike Sundstrom

Test Conditions:

Test #	Date of Test	Test Voltage	Temperature	Humidity
RE 4	04/06/99	115 Vac @ 60 Hz	20°C	35%
MW-1	05/06/99	115 Vac @ 60 Hz	22°C	30%
RE4	04/22/99	115 Vac @ 60 Hz	21°C	68%
RE 3A	04/21/99	115 Vac @ 60 Hz	20°C	55%
MW 1	04/22/99	115 Vac @ 60 Hz	22°C	71%

Purpose:

The tests are intended to demonstrate the compliance of the Equipment Under Test (E.U.T.) to the limits for radiated emissions as defined by CFR 47, Part 15, Subpart B, for Class A Digital Devices, Paragraph Number 15.109 and Subpart C, Paragraph Numbers 15.209 and 15.231.

Test Results (CFR 47, Part 15, Subpart B, Class A, Paragraph Number 15.109):

The E.U.T. complies.

Test # RE 4 (30 MHz to 1 GHz):

The worst case radiated emission is 34.2 dB μ V/m at 317.0 MHz at a distance of 3 meters in Horizontal polarization. This is 12.19 dB below the quasi-peak specification limit of 46.4 dB μ V/m.

Test # MW-1 (1 GHz to 2 GHz):

The worst case microwave radiation emission is 35 dB μ V/m at 2 GHz at a distance of 3 meters in Vertical polarization. This is 19 dB below the average specification limit of 54 dB μ V/m.

Measurement Data:

See test data on pages 23 and 25.

*EQUIPMENT: NT 132 / 315 READER***Specification Limits (CFR 47, Subpart B, 15.109):**

Frequency (MHz)	Maximum Field Strength at 3 m and 10 m (Unintentional)			
	3 m ($\mu\text{V/m}$)	3 m (dB $\mu\text{V/m}$)	10 m ($\mu\text{V/m}$)	10 m (dB $\mu\text{V/m}$)
30 – 88	300	49.5	90	39.1
88 – 216	500	54	150	43.5
216 – 960	700	56.9	210	46.4
Above 960	1000	60	300	49.5

Test Results (CFR 47, Part 15, Subpart C, Paragraph Numbers 15.209 and 15.231):

The E.U.T. complies.

Test # RE4 and RE 3A (100 kHz to 5 GHz):

The worst case radiated emission is 49.4 dB $\mu\text{V/m}$ at 629.8 MHz at a distance of 3 meters in Horizontal polarization. This is 6.17 dB below the quasi-peak specification limit of 55.6 dB $\mu\text{V/m}$.

Test # MW 1 (1 GHz to 5 GHz):

The worst case microwave radiation emission is 27 dB $\mu\text{V/m}$ at 1.257 GHz at a distance of 3 meters in Horizontal polarization. This is 28.65 dB below the average specification limit of 55.65 dB $\mu\text{V/m}$.

Measurement Data:

See test data on pages 27, 28 and 31.

EQUIPMENT: NT 132 / 315 READER

Specification Limits (CFR 47, Subpart C, 15.209):

Frequency	Maximum Field Strength (Intentional)	
(MHz)	Field strength ($\mu\text{V/m}$)	Measurement distance (meters)
0.009-0.490	2400/F (kHz)	300
0.490-1.705	24000/F (kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Specification Limits (CFR 47, Subpart C, 15.231):

Frequency	Maximum Field Strength at 3 m (Intentional)			
(MHz)	Fundamental 3 m ($\mu\text{V/m}$)	Fundamental 3 m (dB $\mu\text{V/m}$)	Spurious 3 m ($\mu\text{V/m}$)	Spurious 3 m (dB $\mu\text{V/m}$)
315	6060	75.65	606	55.65

The spectrum was searched to the 10th harmonic of the highest fundamental clock frequencies per CFR 47, Part 15, Subpart C, Paragraph 15.209.

Method of Measurement (Procedure ANSI C63.4-1992):

The equipment was prescanned in a shielded room using a spectrum analyzer and broadband antenna. A list of frequencies was compiled for investigation in the open field. The equipment was then moved to an open area test site where amplitude measurements were made at a distance of 10 meters for Subpart B and 3 meters for Subpart C. The bandwidth was set to 100 kHz and the detector function was Peak. Any emission within 6 dB of the specification limit is re-measured using a reference tuned dipole antenna per ANSI C63.4.

For L-F radiated emissions measurements, the equipment was scanned in an anechoic chamber where amplitude measurements are made at a distance of 3 meters. The bandwidth is set to 10 kHz and the detector function is quasi-peak.

Any emission above 1 GHz was measured with horn antenna and low noise pre-amplifier at a distance of 3 meters.

EQUIPMENT: NT 132 / 315 READER

Test Data - Radiated Emissions Test # RE 4 (Subpart B):

CLIENT NAME:		AXCESS				W.O.#: 8L0012E		DATE:		04/06/99						
EUT MODEL:		NT 132 / 315 Reader (serial)				SERIAL #:		0101099017		TIME:		1030				
EUT CONFIG.:		ON, NO TAG						TECH.:		M.SUNDSTROM						
TEST SPECIFICATION:		FCC A RAD						TEST NUMBER:		RE 4						
ROD ANT. #:		CABLE #:		2B		DETECT. TYPE:		PEAK		LOCATION:		B OATS				
BICON ANT. #:		2013		PREAMP. #:		401		RES. BW (kHz):		100		DISTANCE (m):		3		
LOG ANT. #:		2027		LIMITER#		181		VIDEO BW (kHz):		100		EUT VOLTAGE:		115 VAC		
HORN ANT. #:				ATTEN.#:		N/A		TEMP. (deg. C):		20		EUT FREQ. (Hz):		60		
DIPOLE ANT #:				DETECTOR#:		2619		HUMIDITY (%):		35		PHOTO ID:			8L0012E RE 4 RAD. EM.	
Emission Frequency (MHz)		Ant. Pol. (H/V)	Det. Atten. (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. Limit (dBuV/m)	CR/SL Delta (dB)	Pass Fail Marginal	Notes				
35.6		V	0.0	23.0	11.4	1.9	24.6	11.7	39.1	-27.44	Pass	NOISE FLOOR				
195.0		V	0.0	23.0	16.5	3.3	24.6	18.1	43.5	-25.37	Pass	NOISE FLOOR				
250.0		V	0.0	23.0	17.0	4.5	24.6	19.9	46.4	-26.52	Pass	NOISE FLOOR				
31.0		H	0.0	21.0	11.7	1.9	24.6	10.0	39.1	-29.12	Pass	NOISE FLOOR				
168.5		H	0.0	21.0	15.2	3.3	24.6	14.9	43.5	-28.58	Pass	NOISE FLOOR				
295.0		H	0.0	21.0	19.4	4.5	24.6	20.3	46.4	-26.1	Pass	NOISE FLOOR				
317.0		H	0.0	40.0	13.9	5.1	24.7	34.2	46.4	-12.19	Pass					
457.0		H	0.0	21.0	17.7	5.9	24.9	19.7	46.4	-26.7	Pass	NOISE FLOOR				
980.0		H	0.0	21.0	24.6	9.1	24.9	29.9	49.5	-19.62	Pass	NOISE FLOOR				
317.0		V	0.0	37.0	13.9	5.1	24.7	31.2	46.4	-15.19	Pass					
500.0		V	0.0	21.0	18.9	6.7	25.1	21.5	46.4	-24.94	Pass	NOISE FLOOR				
998.0		V	0.0	21.0	24.8	9.1	24.9	30.0	49.5	-19.5	Pass	NOISE FLOOR				
												Scanned 30MHz to 1GHz				

EQUIPMENT: NT 132 / 315 READER

Radiated Emissions Photographs for Test # RE 4 (Subpart B):

FRONT VIEW:



REAR VIEW:



Test Data – Microwave Radiated Emissions Test # MW-1 (Subpart B):

Complete X Preliminary Page 1 of 1

Client: AXCESS Test #: MW-1 W.O.#: 8L0012E

EUT: NT 132/315 Reader (serial) S/N: 0101099017 Photo ID 8L0012emw1

Technician: M.Sundstrom Specification: CFR 47 B 15.109B Lab: B OATS Date: 05/06/99

Equipment Used: G2616,CF32,EM2200,CF35,494

Configuration: On, No Tag

Bandwidth: <u>1</u> MHz	Video Bandwidth: <u>1</u> MHz	Antenna Distance	<u>3</u> m	Detector:
Climatic Conditions:	EUT Power: <u>X</u> 115 V.A.C.	<u>X</u> 60 Hz	<u> </u> Peak	
Temperature: <u>22</u> C	<u> </u> 208 V.A.C.	<u> </u> 50 Hz	<u>X</u> Average	
Relative Humidity: <u>30</u> %	<u> </u> 230 V.A.C.			
Atmospheric Pressure: <u>1005</u> mbar	<u> </u> Other _____	<u>X</u> 1 Phase	<u> </u> 3 Phase	
Conversion: _____ dBpW= _____ dBuV/m @ _____ m				

[illegible]

EQUIPMENT: NT 132 / 315 READER

Microwave Radiated Emissions Photographs for Test # MW-1 (Subpart B):

FRONT VIEW:



REAR VIEW:



EQUIPMENT: NT 132 / 315 READER

Test Data - Radiated Emissions for Test # RE4 (Subpart C):

Radiated Emissions FCC								
Complete <u> X </u> Preliminary <u> </u>		Page <u> 1 </u> of <u> 1 </u>						
Client: <u> AXCESS </u>		W.O.#: <u> 8L0012E </u>		Date: <u> 04/22/99 </u>				
EUT: <u> NT 132/315 Reader </u>		S/N: <u> 0101099017 </u>		Specification: <u> 15.231 / 15.209 </u>				
Tech: <u> M.Sundstrom </u>		Test #: <u> RE4 </u>		Lab: <u> ANC 2 </u>		Photo ID: <u> 8L0012 RE4 </u>		
Equipment Used: <u> 099,c60,c45,g2037 </u>				Antenna Distance: <u> 3 </u>				
Configuration: <u> On with Tag [Tag # 36273] </u>								
IF Bandwidth: <u> 10KHz </u>		Video Bandwidth <u> N/A </u>		Detector: <u> </u> Peak <u> X </u> Quasi Peak				
Ambient Temperature: <u> 21 </u> C		EUT Power: <u> X </u> 115 V.A.C.		<u> X </u> 60 Hz		<u> X </u> 1 Phase		
Relative Humidity: <u> 68 </u> %		<u> </u> 230 V.A.C.		<u> </u> 50 Hz		<u> </u> 3 Phase		
Atmospheric Pressure: <u> 1008 </u> mbar		<u> </u> Other <u> </u>						
Freq. (MHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV)	Spec.limit (dBuV) FCC	Pol.	Comments: VR = Vertical Rod Antenna
0.1315	13	-2.4	0	0	10.6	105.2	VR	
0.263	11	-2.4	0	0	8.6	99.21	VR	
2.894	16	-2.4	0	0	13.6	69.54	VR	
3.026	22	-2.4	0	0	19.6	69.54	VR	
3.157	32	-2.4	0	0	29.6	69.54	VR	
3.289	28	-2.4	0	0	25.6	69.54	VR	
20.131	21	-2.4	0	0	18.6	69.54	VR	
20.394	22	-2.4	0	0	19.6	69.54	VR	
21.447	22	-2.4	0	0	19.6	69.54	VR	
27.368	26	-2.4	0	0	23.6	69.54	VR	
27.63	28	-2.4	0	0	25.6	69.54	VR	
27.762	30	-2.4	0	0	27.6	69.54	VR	
27.894	31	-2.4	0	0	28.6	69.54	VR	
28.026	32	-2.4	0	0	29.6	69.54	VR	
28.157	33	-2.4	0	0	30.6	69.54	VR	
28.946	34	-2.4	0	0	31.6	69.54	VR	
29.99	33	-2.4	0	0	30.6	69.54	VR	
								Scanned 0.1MHz to 30MHz

Note: Verify that the IF Bandwidth is in the proper setting.

EQUIPMENT: NT 132 / 315 READER

Test Data - Radiated Emissions Test # RE 3A (Subpart C):

CLIENT NAME:		ACCESS					W.O.#8L0012E		DATE:		04/21/99				
EUT MODEL:		NT 132 / 315 Reader					SERIAL #:		0101099017		TIME:		0700		
EUT CONFIG.:		ON WITH TAG [Tag 1# 36273] [Tag 2# 51110]							TECH.:		M.SUNDSTROM				
TEST SPECIFICATION:		FCC 15.231 3M (Tx 315 MHz)							TEST NUMBER:		RE 3A				
ROD ANT. #:		CABLE #:		2B		DETECT. TYPE:		PEAK		LOCATION:		B OATS			
BICON ANT. #:		2013		PREAMP. #:		401		RES. BW (kHz):		100		DISTANCE (m):		3	
LOG ANT. #:		2027		LIMITER#		181		VIDEO BW (kHz):		100		EUT VOLTAGE:		115 VAC	
HORN ANT. #:				ATTEN #:		N/A		TEMP. (deg. C):		20		EUT FREQ. (Hz):		60	
DIPOLE ANT #:				DETECTOR#:		2619		HUMIDITY (%):		55		PHOTO ID:		8L0012E RE 3A RAD. EM.	
Emission Frequency (MHz)	Ant. Pol. (H/V)	Det. Atten. (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. Limit (dBuV/m)	CR/SL Delta (dB)	Pass Fail Marginal	Notes				
33.0	V	0.0	41.0	11.6	1.9	24.6	29.8	55.6	-25.78	Pass					
49.8	V	0.0	43.0	12.4	1.9	24.6	32.6	55.6	-22.98	Pass					
64.8	V	0.0	47.0	11.1	2.5	24.6	36.0	55.6	-19.6	Pass					
69.8	V	0.0	54.0	8.9	2.5	24.6	40.8	55.6	-14.75	Pass					
74.8	V	0.0	52.0	7.9	2.5	24.6	37.8	55.6	-17.8	Pass					
79.8	V	0.0	49.0	7.1	2.5	24.6	34.0	55.6	-21.6	Pass					
84.8	V	0.0	44.0	9.7	2.5	24.6	31.7	55.6	-23.92	Pass					
130.0	V	0.0	34.0	11.7	3.3	24.6	24.4	55.6	-31.22	Pass					
135.0	V	0.0	36.0	12.0	3.3	24.6	26.7	55.6	-28.92	Pass					
140.0	V	0.0	40.0	12.3	3.3	24.6	31.0	55.6	-24.62	Pass					
150.0	V	0.0	39.0	13.2	3.3	24.6	30.9	55.6	-24.72	Pass					
30.1	H	0.0	34.0	11.8	1.9	24.6	23.1	55.6	-32.54	Pass					
39.1	H	0.0	36.0	11.5	1.9	24.6	24.7	55.6	-30.86	Pass					
50.0	H	0.0	39.0	12.5	2.5	24.6	29.4	55.6	-26.18	Pass					
65.0	H	0.0	39.0	10.7	2.5	24.6	27.6	55.6	-28.03	Pass					
70.0	H	0.0	44.0	8.5	2.5	24.6	30.4	55.6	-25.16	Pass					
75.0	H	0.0	46.0	7.7	2.5	24.6	31.6	55.6	-23.96	Pass					
85.0	H	0.0	37.0	10.4	2.5	24.6	25.4	55.6	-30.21	Pass					
110.0	H	0.0	33.0	15.2	2.9	24.6	26.5	55.6	-29.06	Pass					
115.0	H	0.0	32.0	14.8	2.9	24.6	25.1	55.6	-30.51	Pass					
120.0	H	0.0	34.0	14.3	2.9	24.6	26.6	55.6	-28.96	Pass					
130.0	H	0.0	40.0	11.7	3.3	24.6	30.4	55.6	-25.22	Pass					
140.0	H	0.0	39.0	12.3	3.3	24.6	30.0	55.6	-25.62	Pass					
150.0	H	0.0	38.0	13.2	3.3	24.6	29.9	55.6	-25.72	Pass					
230.0	H	0.0	37.0	15.1	4.1	24.6	31.6	55.6	-24.02	Pass					
235.0	H	0.0	37.0	15.5	4.1	24.6	32.1	55.6	-23.55	Pass					
240.0	H	0.0	32.0	16.0	4.1	24.6	27.5	55.6	-28.07	Pass					
											Added ferrite P# 2643801002 to Wiegad line				
70.0	V	0.0	42.0	8.5	2.5	24.6	28.4	55.6	-27.16	Pass					
33.0	V	0.0	43.0	11.6	1.9	24.6	31.8	55.6	-23.78	Pass					
49.8	V	0.0	37.0	12.4	1.9	24.6	26.6	55.6	-28.98	Pass					
64.8	V	0.0	40.0	11.1	2.5	24.6	29.0	55.6	-26.6	Pass					
69.8	V	0.0	42.0	8.9	2.5	24.6	28.8	55.6	-26.75	Pass					
74.8	V	0.0	42.0	7.9	2.5	24.6	27.8	55.6	-27.8	Pass					
79.8	V	0.0	42.0	7.1	2.5	24.6	27.0	55.6	-28.6	Pass					
84.8	V	0.0	43.0	9.7	2.5	24.6	30.7	55.6	-24.92	Pass					
130.0	V	0.0	36.0	11.7	3.3	24.6	26.4	55.6	-29.22	Pass					
135.0	V	0.0	31.0	12.0	3.3	24.6	21.7	55.6	-33.92	Pass					
140.0	V	0.0	32.0	12.3	3.3	24.6	23.0	55.6	-32.62	Pass					
150.0	V	0.0	32.0	13.2	3.3	24.6	23.9	55.6	-31.72	Pass					

EQUIPMENT: NT 132 / 315 READER

Test Data – Radiated Emissions Test # RE 3A (Subpart C) (Continued):

Emission Frequency (MHz)	Ant. Pol. (H/V)	Det. Atten. (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. Limit (dBuV/m)	CR/SL Delta (dB)	Pass Fail Marginal	Notes
30.1	H	0.0	36.0	11.8	1.9	24.6	25.1	55.6	-30.54	Pass	
39.1	H	0.0	38.0	11.5	1.9	24.6	26.7	55.6	-28.86	Pass	
50.0	H	0.0	32.0	12.5	2.5	24.6	22.4	55.6	-33.18	Pass	
65.0	H	0.0	38.0	10.7	2.5	24.6	26.6	55.6	-29.03	Pass	
70.0	H	0.0	40.0	8.5	2.5	24.6	26.4	55.6	-29.16	Pass	
75.0	H	0.0	41.0	7.7	2.5	24.6	26.6	55.6	-28.96	Pass	
85.0	H	0.0	35.0	10.4	2.5	24.6	23.4	55.6	-32.21	Pass	
110.0	H	0.0	33.0	15.2	2.9	24.6	26.5	55.6	-29.06	Pass	
115.0	H	0.0	31.0	14.8	2.9	24.6	24.1	55.6	-31.51	Pass	
120.0	H	0.0	33.0	14.3	2.9	24.6	25.6	55.6	-29.96	Pass	
130.0	H	0.0	37.0	11.7	3.3	24.6	27.4	55.6	-28.22	Pass	
140.0	H	0.0	33.0	12.3	3.3	24.6	24.0	55.6	-31.62	Pass	
150.0	H	0.0	33.0	13.2	3.3	24.6	24.9	55.6	-30.72	Pass	
230.0	H	0.0	30.0	15.1	4.1	24.6	24.6	55.6	-31.02	Pass	
235.0	H	0.0	26.0	15.5	4.1	24.6	21.1	55.6	-34.55	Pass	NOISE FLOOR
240.0	H	0.0	29.0	16.0	4.1	24.6	24.5	55.6	-31.07	Pass	
314.9	V	0.0	66.0	14.0	5.1	24.7	60.4	75.6	-15.24	Pass	[Tag 1 TX]
629.8	V	0.0	44.0	20.3	7.2	25.1	46.4	55.6	-9.17	Pass	[Tag 1 2ND]
944.9	V	0.0	26.0	24.0	9.1	24.9	34.2	55.6	-21.36	Pass	[Tag 1 3RD]
314.9	H	0.0	68.0	14.0	5.1	24.7	62.4	75.6	-13.24	Pass	[Tag 1 TX]
629.8	H	0.0	50.0	20.3	7.2	25.1	52.4	55.6	-3.17	Pass	[Tag 1 2ND]
629.8	H	0.0	47.0	20.3	7.2	25.1	49.4	55.6	-6.17	Pass	QP [Tag 1 2ND]
629.8	H	0.0	50.0	20.3	7.2	25.1	52.4	55.6	-3.17	Pass	[Tag 2]
629.8	H	0.0	47.0	20.3	7.2	25.1	49.4	55.6	-6.17	Pass	QP [Tag 2]
944.8	H	0.0	37.0	24.0	9.1	24.9	45.2	55.6	-10.36	Pass	[Tag 1 3RD]
											Scanned 30MHz to 1GHz

EQUIPMENT: NT 132 / 315 READER

Radiated Emissions Photographs for Test # RE4 and Test # RE 3A (Subpart C):

REAR VIEW:



FRONT VIEW:



The test set-up for Test # RE 3A was identical to the test set-up for Test # RE4.

Test Data – Microwave Radiated Emissions for Test # MW 1 (Subpart C):

Complete X Preliminary Page 1 of 1

EUT: NT 132 / 315 Reader S/N: 0101099017 Photo ID: 8L0011EMW1

Equipment Used: G2616,CF26,421,CF34,216

Configuration: On with Tag (tag # 36273)

Bandwidth: 1 MHz Video Bandwidth: Narrow Antenna Distance 3 m Detector:

Climatic Conditions:		EUT Power:	<u> x </u> 115 V.A.C.	<u> x </u> 60 Hz	<u> </u> Peak
Temperature:	<u> 22 </u> C		<u> </u> 208 V.A.C.	<u> </u> 50 Hz	<u> x </u> Average
Relative Humidity:	<u> 71 </u> %		<u> </u> 230 V.A.C.		
Atmospheric Pressure:	<u>1005</u> mbar		<u> </u> Other _____	<u> x </u> 1 Phase	<u> </u> 3 Phase

[illegible]

EQUIPMENT: NT 132 / 315 READER

Radiated Emissions Photographs for Test # MW 1 (Subpart C):

FRONT VIEW:



REAR VIEW:



EQUIPMENT: NT 132 / 315 READER

Section 7. Sample Calculations

Conducted Emissions:

If the Quasi-Peak to Average ratio is greater than 6 dB, then the emission is classified as broadband and its Quasi-Peak level is reduced by 13 dB for comparison to the limit.

- i.e. Quasi-Peak level = 40 dB μ V
 Average level = 34 dB μ V
 Corrected level = 40 - 13 = 27 dB μ V

Radiated Emissions:

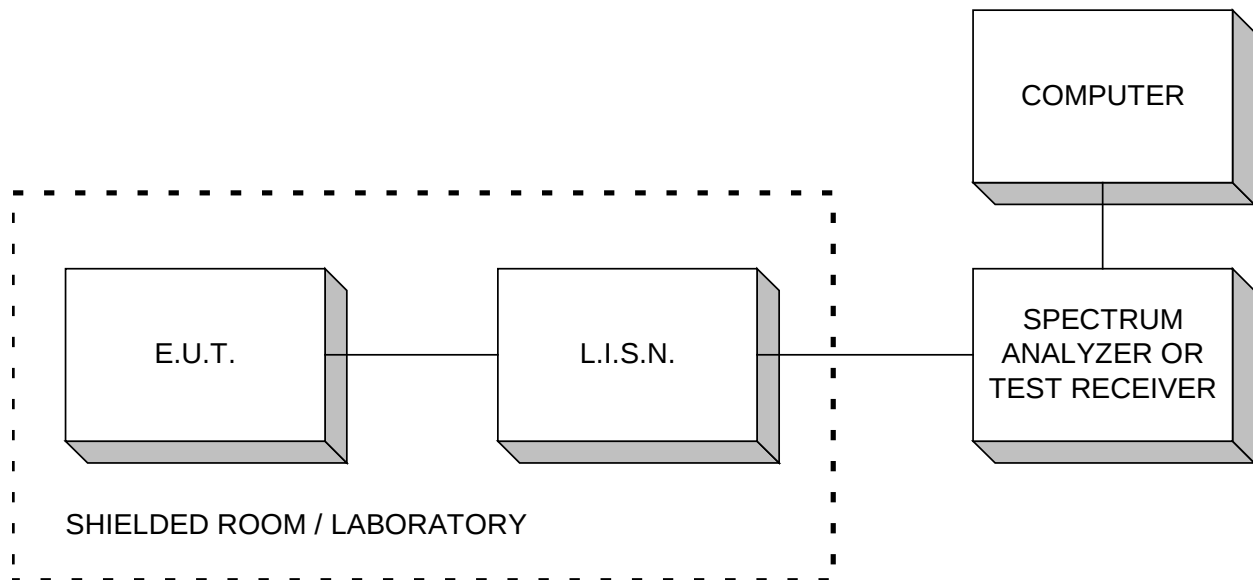
Emissions are measured at a distance of 10 meters and corrected for antenna factor and cable loss.

- i.e. Received Signal = 25 dB μ V @ 100 MHz
 Antenna Factor & Cable Loss = 9.8 dB
 Field Intensity = 25 + 9.8 = 34.8 dB μ V/m @ 10 m

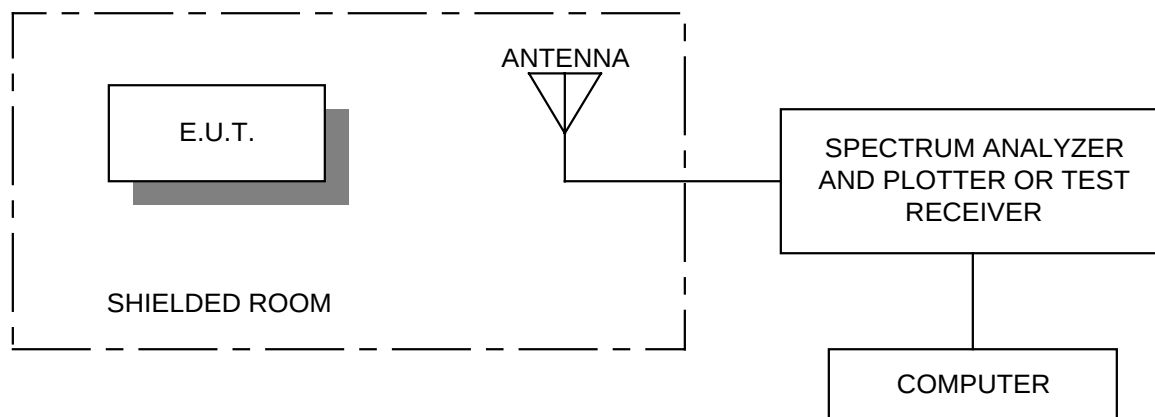
EQUIPMENT: NT 132 / 315 READER

Section 8. Block Diagrams

Conducted Emissions:

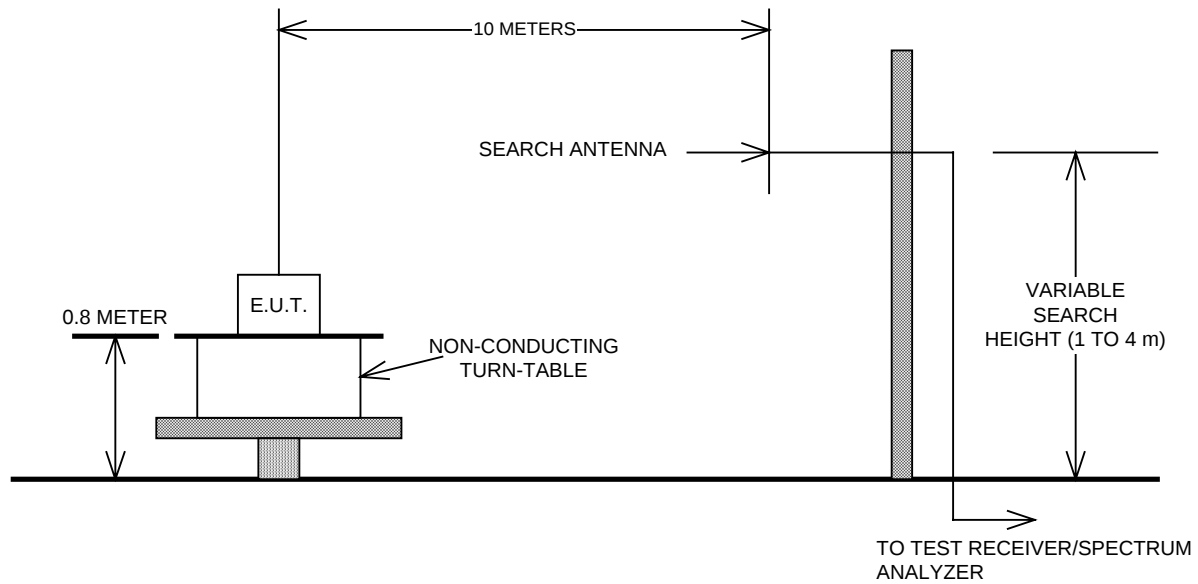


Radiated Prescan:



EQUIPMENT: NT 132 / 315 READER

Outdoor Test Site for Radiated Emissions:



The spectrum was scanned per CFR 47, Part 15, Subpart A, Paragraph Number 15.33.

EQUIPMENT: NT 132 / 315 READER

Section 9. Test Equipment List

The listing below indicates the test equipment utilized for the test (s). Calibration interval on all items is typically 12 months from the calibration date shown.

<u>KTLID</u>	<u>Nomenclature</u>	<u>Manufacturer Model Number</u>	<u>Serial Number</u>	<u>Calibration Date</u>
C2B	B O.A.T.S. Cable Set			12/07/98
C24	RG 223 Cable (14.8 meters)			08/10/98
C30	RG 223 Cable (1.0 meter)			08/12/98
C45	RG223 Cable (8.5 meters)			08/10/98
C60	RG223 Cable (3.4 meters)			08/07/98
CF26	Semi Flex Cable (1 meter)			01/13/99
CF32	Cable (1.0 meter)			01/29/99
CF34	Storm Cable (3.65 meter)			04/01/99
CF35	Storm Cable (3.65 meter)			04/01/99
099	Receiver	Polarad ESH2	879342/005	07/06/98
181	Limiter	Fischer FCC-45013-1.2	NSN	02/05/99
215	LISN (10 kHz - 100 MHz)	Schwarzbeck 8120	8120281	05/09/98
216	Horn Antenna (1GHz - 18 GHz)	EMCO 3115	8812-3035	07/20/99
401	Low Noise Preamplifier (1 MHz – 1 GHz)	RF Consultants LNA-14	020	08/13/98
421	Low Noise Preamplifier (1 MHz - 1 GHz)	International Compliance Corporation		04/26/99
494	Horn Antenna	A.H. Systems SAS-200/571	162	08/13/98
EM2200	Amplifier	Hewlett Packard 8449A	2749A00159	06/11/99
G1501	Limiter	Fischer FCC-45013-1.2	181	02/05/99
G1707	Filter, High Pass, 5 kHz	Solar 7930-5.0	933126	11/16/98
G2013	Antenna, Biconical	Emco 3104	3243	01/21/99

EQUIPMENT: NT 132 / 315 READER

Test Equipment List (Continued):

The listing below indicates the test equipment utilized for the test (s). Calibration interval on all items is typically 12 months from the calibration date shown.

<u>KTLID</u>	<u>Nomenclature</u>	<u>Manufacturer Model Number</u>	<u>Serial Number</u>	<u>Calibration Date</u>
G2027	Antenna, LP	Emco 3146	1349	01/26/99
G2037	Active Monopole Antenna	A.H. Systems SAS-200/550-1	718	08/27/98
G2616	Spectrum Analyzer	Tektronix 492P	B043496	11/11/98
G2619	Spectrum Analyzer	Advantest R4131D	00350640	11/04/98
		LAB #2 (INDOOR)		
		ANECHOIC CHAMBER # 2		
	Antenna Tripod	Polarad HFU-2		CNR
		SITE B O.A.T.S. (OPEN AREA TEST SITE) 10 Meter Site		
	Turntable Flush Mounted, Metal Covered, 8 Foot	RF Consultants Model AT-8 (Automated)		CNR
	Antenna Mast, 4 Meter	ICC (Automated)		CNR

Calibration interval on all items is typically 12 months from the calibration date shown. Where relevant, measuring equipment is subjected to in-service checks between testing. Should any measurement equipment be utilized beyond its scheduled calibration date, the measuring equipment is subjected to in-service checks prior to use. KTL shall notify clients promptly, in writing, of identification of defective measuring equipment that casts doubt on the validity of results given in this report.

Legend:

CNR Calibration not required
N/A Not applicable
CBU Calibrated before use