

TEST NUMBER - 385-03

TEST REPORT TO
CFR TITLE 47 FCC PART 15 SUBPART B
IC ES 003, ISSUE 3
EN55013:2001
EN55103-1:1997 Level E1
(EUT also meets levels E2 through E5)

for

AudioRail Technologies
3 Silver Hill Rd.
Maynard Mass.
01754
(978)-461-1744

of

4x ADAT Lightpipe over CAT5 Network

on

12/9/2003

Tested by

Andrew Mertinooke

Reviewed by

Clifton P Brick

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TEST DESCRIPTION

1. TEST OBJECTIVE

To test the 4x ADAT Lightpipe over CAT5 Network to EN55103-1:1997 and EN55013 limits and write a report. Per Section 7.1 of IC ES 003, Issue 3 and FCC Part 15.107e & 15.109g, EN 55022 limits and test procedures may be used in lieu of IC ES 003 and FCC Part 15 rule limits, EN55103-1 uses EN55022 Procedures and Limits for Radiated and Conducted emissions.

2. E.U.T. DESCRIPTION

GENERAL

The 4x ADAT Lightpipe over CAT5 Network is a professional audio device that allows interconnection of multiple devices via ADAT. AudioRail™ is a simple and elegant Patent Pending method for transporting many channels of digital audio over a daisy chain of standard Category 5 UTP (Unshielded Twisted Pair) cable or other LAN interconnect media using off the shelf Ethernet transceiver technology, forming a digital audio snake.

Ethernet physical layer transceivers contain the technology to transport 100 Mbps or more of full duplex data over inexpensive Category 5 or other conventional Ethernet cable. In the case of Fast Ethernet, 100 Mbps of bandwidth can easily accommodate the equivalent of 32 channels of analog audio in each direction simultaneously (64 channels aggregate) at a sample rate of 48 KHz (or half of that number of channels for 96 KHz sample rate). Instead of using conventional packet/frame store and forward methods, AudioRail streams time division multiplexed data directly in and out of the phy transceiver's MII, GMII, Serdes, or comparable off the shelf phy interface port, with only a few microseconds latency, end to end.

SERIAL NUMBERS:

Production Prototype

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TEST RESULTS AND CONCLUSIONS

PRODUCT TESTED - 4x ADAT Lightpipe over CAT5 Network

MODEL NUMBER - 4x ADAT Lightpipe over CAT5 Network

ANALYSIS AND CONCLUSIONS

Based upon the measurement results we find that this equipment is within the limits of the EN 55022 / EN 55103-1 rules. All results are based on a test of one sample, and represent other production units, only in as much as a sample represents other production units. If any significant changes are made to the unit, the changes shall be evaluated and a retest may be required.

NOTES (Special conditions unique to this test)

None.

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TEST PROCEDURES

1. TEST EQUIPMENT

- A. HP 8546A (9 kHz - 6.5 GHz) EMI Receiver w/Filter Section, S/N 360.
Calibration Date: 12-28-2002, calibrated annually.
- B. Com-Power Biconilog Antenna, Model AC220, S/N 25509.
Calibration Date 3-11-2003, calibrated annually.
- C. EMCO LISN, Model EM 3825/2, S/N 9109-1860.
Calibration Date: 3-9-2003, calibrated annually.
- D. Stanford Research, Model SR780 Network Analyzer, S/N 31569.
Calibration Date: 11-17-2003, Calibrated annually.
- E. Compliance Worldwide EN55103-1/-2 Magnetic Field Probe.
Calibration Not Required, verified before use.
- F. Voltech, Model PMI Power Analyzer, S/N 00534644.
Calibration Date: 8-14-2003, Calibrated annually.
- G. Schaffner, Model T400, 4 wire CDN, S/N 16901.
Calibration Date: 10-22-2003, Calibrated annually.

2. FREQUENCY RANGES TO BE SCANNED.

- A. Radiated Test from 30 MHz to 1.0 GHz.
- B. Conducted Test from 150 kHz to 30 MHz.

3. TEST PROCEDURES.

All measurements are made according to the procedures defined in or referred to by: "EN 55103-1: 1997 Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use" and "EN55022: 1998 Limits and methods of measurement of radio disturbance characteristics of information technology equipment"

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EN 55103-1: 1997 TEST LEVELS

Environments

EN55103-1 Limits are based on the environment that the EUT will be used in:

E1: residential (including both of the location types class 1 and 2 found in IEC 1000-2-5)

E2: commercial and light industrial (including for example, theatres)

E3: urban outdoors (based on the definition of location type class 6 in IEC 1000-2-5)

E4: controlled EMC environment (for example purpose built broadcasting or recording studio), and the rural outdoors environment (far away from railways, transmitters, overhead power lines, etc.)

E5: heavy industrial (see EN 50081-2); and environments close to broadcast transmitters

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TEST FACILITY DESCRIPTION

Compliance Worldwide is located on 357 Main Street in Sandown, New Hampshire. The EN 55022 / AS/NZS 3548 conducted and radiated test sites, located at C.W. are also used for Federal Communications Commission (FCC) testing. A site description is on file with the FCC in Columbia, MD USA.

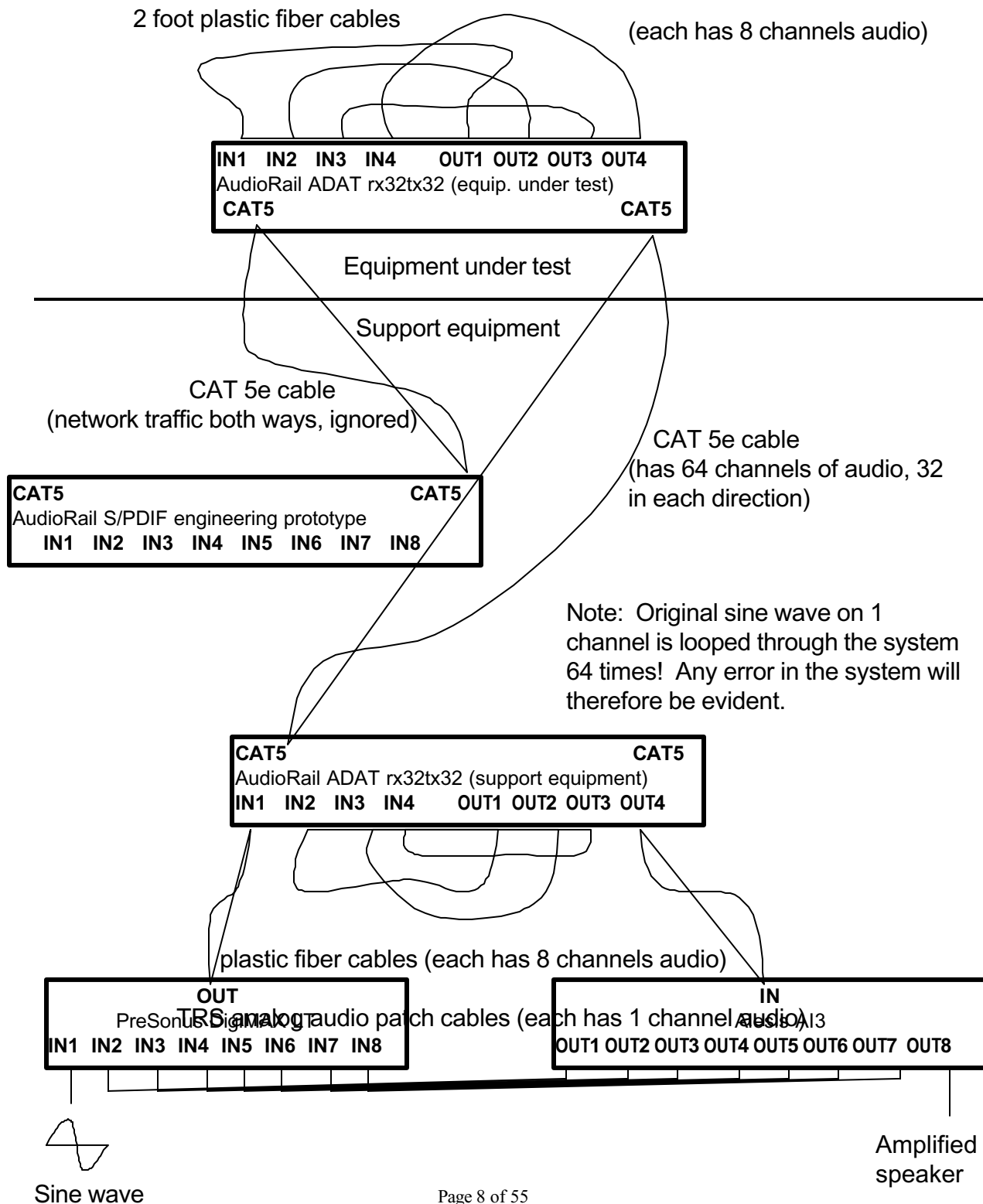
The radiated site is a 10 meter indoor site with an enclosure for the product, antennas and test equipment.

The conducted site is contained in a shielded room and uses the rear wall of the room for the vertical metal wall requirements of EN 55022 (CISPR 22) testing.

Both sites are designed to test products or systems 1.5 meter x 1.0 meter, floor standing or table top.

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TEST SET UP AND PERIPHERAL CONNECTION INFORMATION



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TEST SETUP INFO CONTINUED

Description	Manufacturer	Model
ADAT lightpipe	AudioRail	ADAT rx32tx32
Traffic Generator	AudioRail	S/PDIF
Analog Line Generator	Alesis	AI3
Analog Line Acceptor	PreSonus	DigiMAX LT

Boom Box
55Hz Sine wave generator

Cables:

TYPE	QUANTITY	LENGTH	SHIELDING
Optical cables	4	.6 meters	no
UTP Cat 5	2	50 meters	no

PHENOMENA 1

RADIATED TEST LIMITS Method A only, at 10m

Level	E1	E2	E3	E4	E5
Limit	30 - 230 MHz 30dBuV/m 230 - 1000 MHz 37dBuV/m			30 - 230 MHz 40dBuV/m 230 - 1000 MHz 47dBuV/m	

The limit above has been increased 10dB for this test, as the testing was performed at 3 meters.

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PHENOMENA 1

RADIATED TEST RESULTS

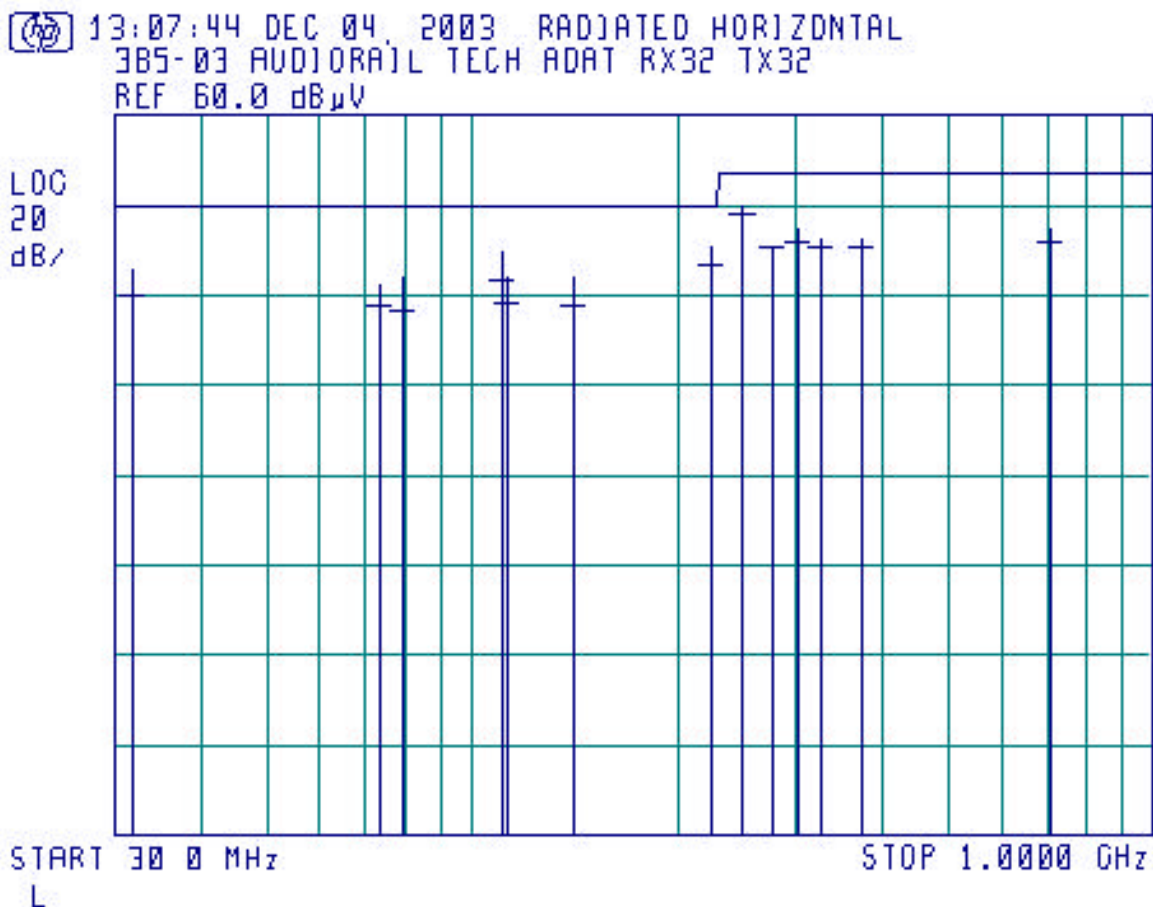
Frequency Range: 30 - 1000 MHz.
Measurement Distance: 3 Meters.
Bandwidth: 120 kHz, Per CISPR 16.1
Detector Functions: Peak, Quasi Peak.
Video Filter: 300 kHz
Table Height: 0.8 meters
Antenna Height Variation: 1 - 4 Meters.
Horizontal and Vertical Polarization Measurements Taken.

PLEASE SEE NEXT PAGE(S) FOR RADIATED TEST DATA

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PHENOMENA 1

Radiated Horizontal Data Log Plot



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PHENOMENA 1

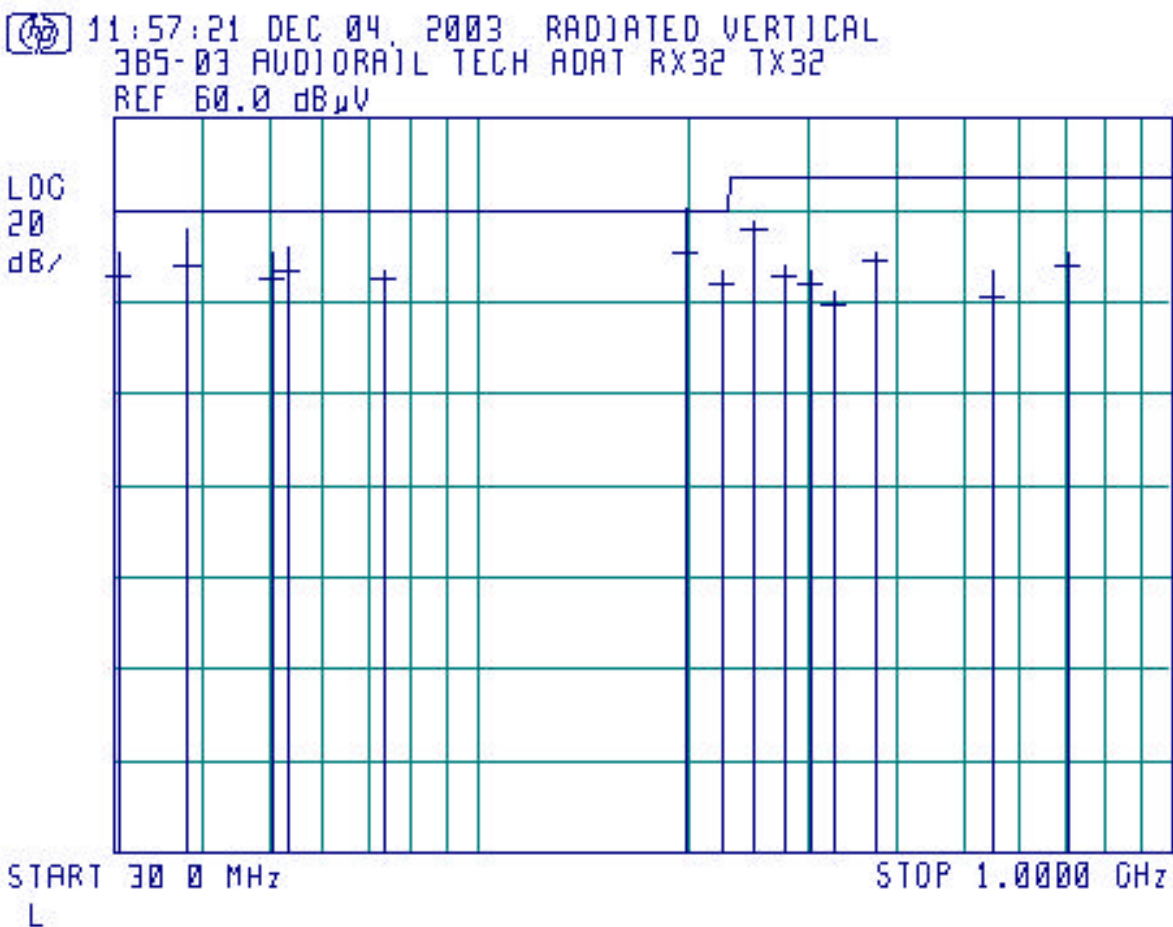
Radiated Horizontal Tabular Data

Freq (MHz)	Azimuth (Degrees)	Antenna Height (Meters)	Peak Amp (dBuV)	QP Amp (dBuV)	QP Limit (dBuV)	QP Margin (dB)
32.014768	10	2.3	25.81	20.92	40.00	-19.08
73.706252	100	2.9	22.56	18.60	40.00	-21.40
79.650992	234	2.5	24.09	16.36	40.00	-23.64
110.605960	60	2.2	29.73	23.95	40.00	-16.05
112.661648	244	1.9	24.56	19.18	40.00	-20.82
141.215272	120	2.2	24.80	18.41	40.00	-21.59
224.993565	274	1.8	30.41	27.37	40.00	-12.63
250.001900	244	1.1	39.83	38.74	47.00	-8.26
274.990051	244	1.0	31.86	30.54	47.00	-16.46
299.991819	244	1.0	34.61	32.20	47.00	-14.80
325.001496	258	1.0	32.90	30.95	47.00	-16.05
374.981976	240	1.0	32.90	30.83	47.00	-16.17
699.977030	124	1.3	34.91	32.64	47.00	-14.36

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PHENOMENA 1

Radiated Vertical Data Log Plot



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PHENOMENA 1

Radiated Vertical Tabular Data

Freq (MHz)	Azimuth (Degrees)	Antenna Height (Meters)	Peak Amp (dBuV)	QP Amp (dBuV)	QP Limit (dBuV)	QP Margin (dB)
30.781525	180	1.0	30.96	25.94	40.00	-14.06
38.452346	124	1.0	36.45	28.09	40.00	-11.91
51.001435	124	1.0	30.62	24.96	40.00	-15.04
53.653035	110	1.0	32.21	27.50	40.00	-12.50
73.706252	140	1.5	27.67	24.91	40.00	-15.09
199.999914	174	1.0	40.95	30.38	40.00	-9.62
224.993565	190	1.0	26.85	24.28	40.00	-15.72
250.001900	170	1.0	38.11	36.38	47.00	-10.62
274.990051	204	1.0	28.32	26.42	47.00	-20.58
299.991819	120	1.0	27.62	24.81	47.00	-22.19
325.001496	358	1.0	23.19	19.77	47.00	-27.23
374.981976	188	1.0	31.73	29.16	47.00	-17.84
549.982897	160	1.0	26.97	21.56	47.00	-25.44
699.977030	230	1.0	31.70	28.14	47.00	-18.86

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PHENOMENA 1

RADIATED EMISSIONS TEST SETUP PHOTO (FRONT)



PHENOMENA 1

RADIATED EMISSIONS TEST SETUP PHOTO (REAR)



PHENOMENA 1**DISTURBANCE POWER/RADIATED TEST LIMITS Method B****. Disturbance Power Limits:**

Frequency MHz	Quasi-Peak Limit dB μ V	Average Limit dB μ V
30 - 300	62 to 72*	52 to 62*
300 - 1000	under consideration	

*Limit converted to dB μ V into 50 ohms from dBpW by adding 17dB.

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PHENOMENA 1 Method B

DISTURBANCE POWER TEST RESULTS

Frequency Range: 30 MHz to 300 MHz.

Bandwidth: 120 kHz per CISPR 16.1

Detector Functions: Peak, Quasi-Peak, Average

Table Height: 0.8 meters

Video Bandwidth: 300 kHz.

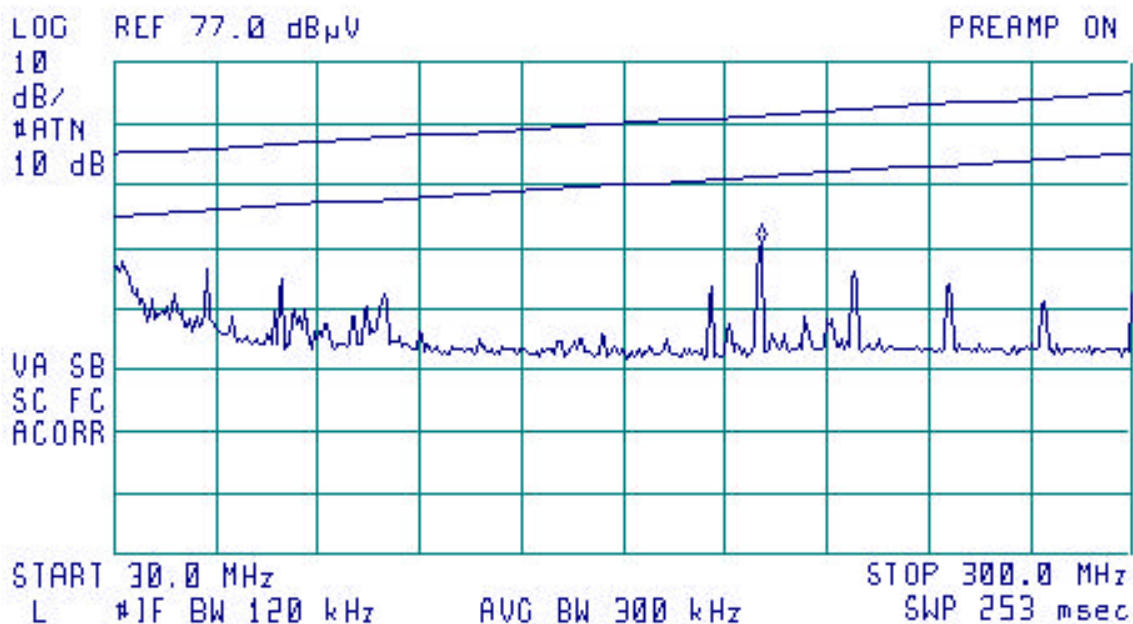
PLEASE SEE NEXT PAGE(S) FOR DISTURBANCE POWER TEST DATA

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PHENOMENA 1 Method B

Disturbance Power Data Log Plot (Power Cable)

14:33:06 DEC 04, 2003 POWER
385-03 AUDIO RAIL TECH ADAT RX32 TX32
ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 201.5 MHz
47.90 dBμV



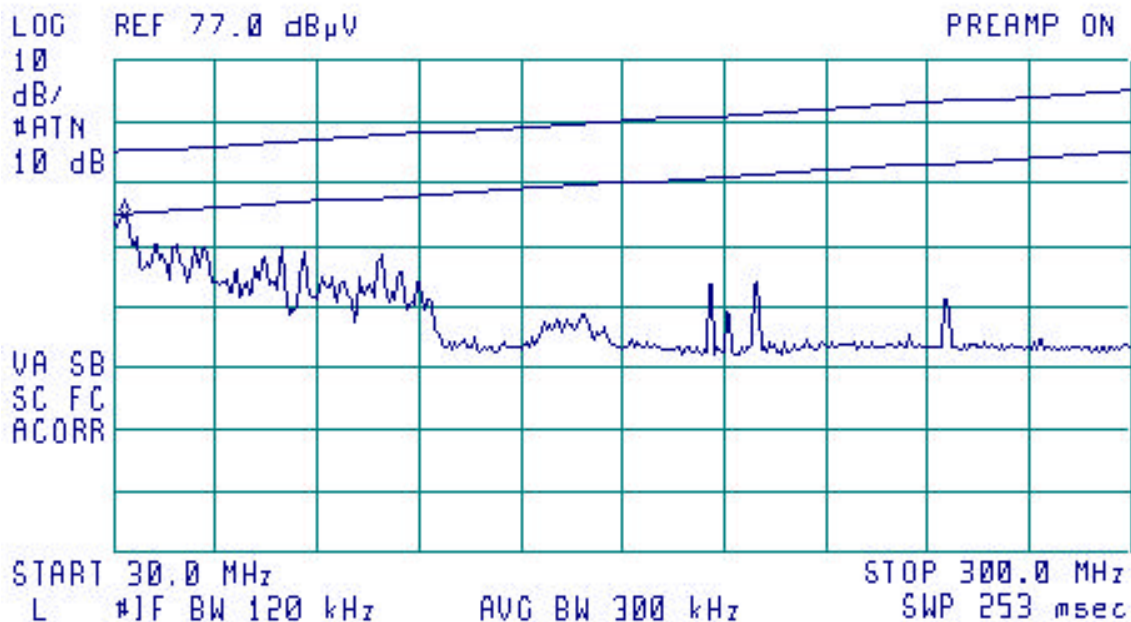
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PHENOMENA 1 Method B

Disturbance Power Data Log Plot (Left Side AudioRail Cable (Cat5))

14:24:40 DEC 04, 2003 LEFT SIDE AUDIORAIL
385-03 AUDIORAIL TECH ADAT RX32 TX32

FREQ 32.73 MHz
PEAK 51.5 dB μ V
QP 46.5 dB μ V
AVG 39.8 dB μ V



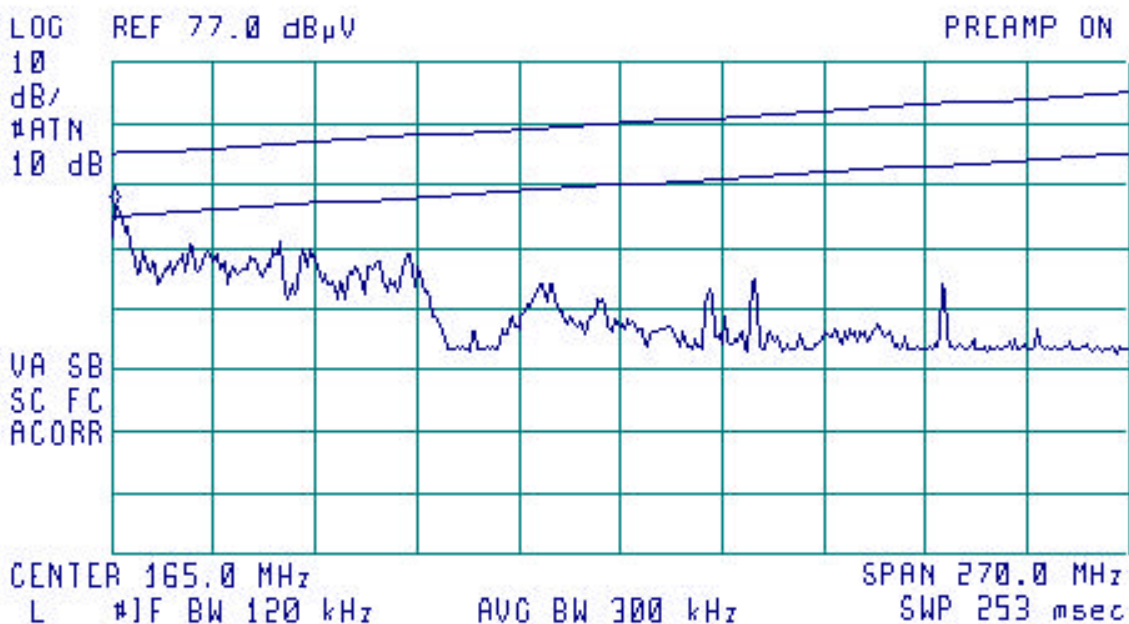
Test Number - 385-03

PHENOMENA 1 Method B

Disturbance Power Data Log Plot (Right Side AudioRail Cable (Cat5))

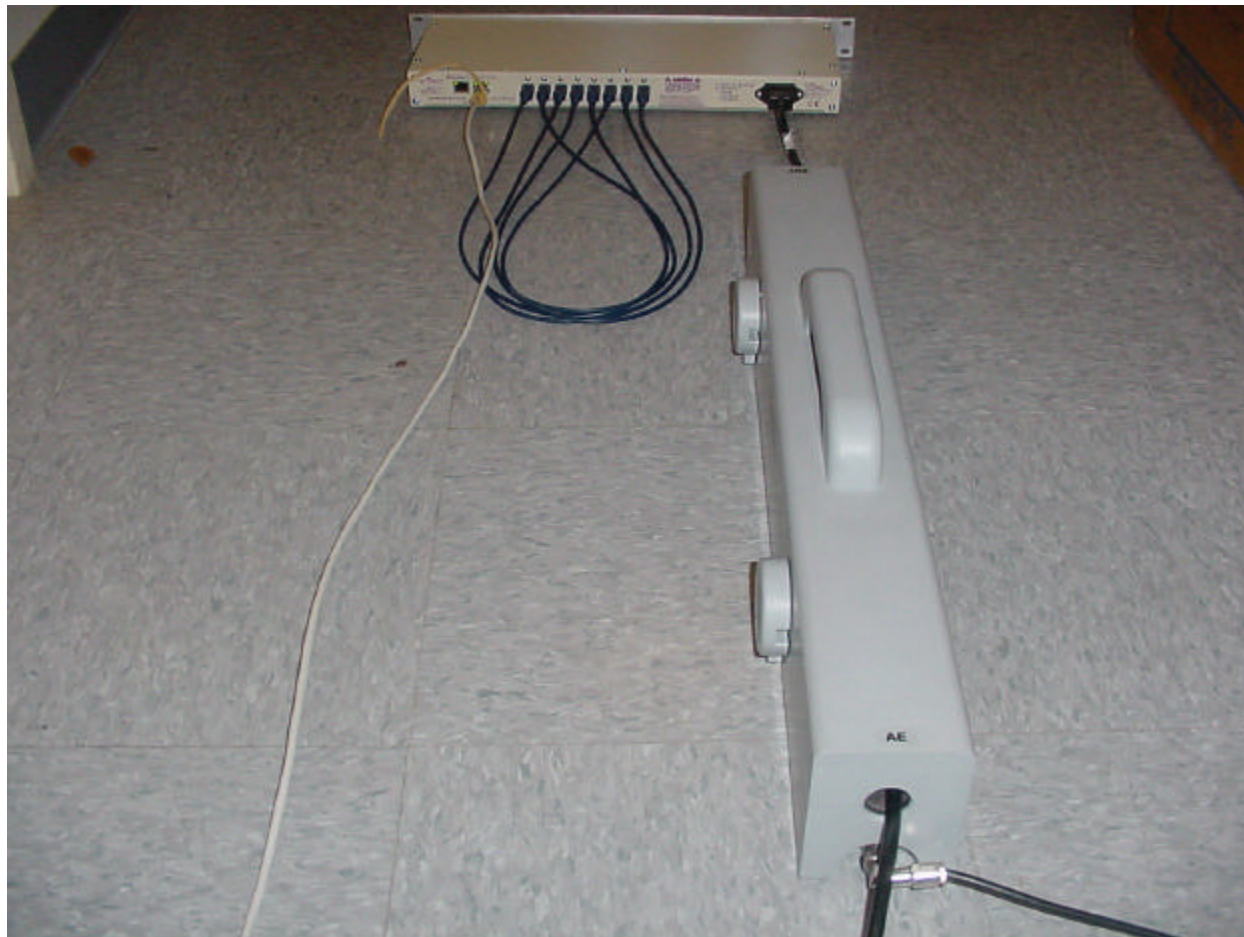
14:12:54 DEC 04, 2003 RIGHT SIDE AUDIORAIL
385-03 AUDIORAIL TECH ADAT RX32 TX32

FREQ 30.53 MHz
PEAK 54.9 dBμV
QP 49.5 dBμV
AVG 42.7 dBμV



PHENOMENA 1 method B

DISTURBANCE POWER TEST SETUP PHOTO



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PHENOMENA 2

MAGNETIC FIELD EMISSIONS @ 10 cm (rack mount only)

Level	E1	E2	E3	E4	E5
Limit	50 - 500 Hz 4 - 0.4 A/m* 500 Hz - 50 kHz 0.4 A/m				No Limits apply

*The limit decreases linearly with the log of the frequency.

PHENOMENA 2

MAGNETIC FIELD EMISSIONS TEST RESULTS

Frequency Range: 50 Hz - 50 kHz
Measurement Distance: 10 centimeters
Input Impedance: 1 Mohm
Detector Functions: RMS
Table Height: 0.8 meters

No signals found near or above the limit for magnetic field emissions using the probe per EN55103-1:1997 Annex A (Normative).

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PHENOMENA 2

MAGNETIC FIELD EMISSIONS TEST SETUP PHOTO



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PHENOMENA 3

MAGNETIC FIELD EMISSIONS @ 1 m (non-rack mount only)

Level	E1	E2	E3	E4	E5
Limit	50 - 500 Hz 1 - 0.01 A/m* 500 Hz - 50 kHz 0.01 A/m				No Limits apply

*The limit decreases linearly with the log of the frequency.

PHENOMENA 3**MAGNETIC FIELD EMISSIONS TEST RESULTS**

Frequency Range: 50 Hz - 50 kHz

Measurement Distance: 1 meter

Bandwidth: 120 kHz, Per CISPR 16.1

Input Impedance: 1 Mohm

Detector Functions: RMS

Table Height: 0.8 meters

No signals found near or above the limit for magnetic field emissions using the probe per EN55103-1:1997 Annex A (Normative).

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PHENOMENA 3

MAGNETIC FIELD EMISSIONS TEST SETUP PHOTO



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PHENOMENA 4

EN 61000-3-2 CURRENT HARMONICS TEST LIMITS

1. Class A Harmonic Limits:

Harmonic Order n	Maximum Permissible harmonic current A
Odd Harmonics	
3	2.3
v5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
$15 \leq n \leq 39$	$0.15 \cdot 15/n$
Even Harmonics	
2	1.08
4	0.43
6	0.30
$8 \leq n \leq 40$	$0.23 \cdot 8/n$

2. Class B Harmonic Limits:

Class B limits are 1.5 times Class A limits.

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PHENOMENA 4

EN 61000-3-2 TEST LIMITS CONTINUED

3. Class C Harmonic Limits >25W without dimmers:

Harmonic Order n	Maximum Permissible harmonic current A
Odd Harmonics	
2	2
3	$30 \cdot \lambda *$
5	10
7	7
9	5
$11 \leq n \leq 39$ (odd harmonics only)	3
* λ is the circuit power factor	

4. Class D Harmonic Limits:

Harmonic Order n	Maximum permissible harmonic current per watt mA/W	Maximum Permissible harmonic current A
3	3.4	2.30
5	1.9	1.14
7	1.0	0.77
9	0.5	0.40
11	0.35	0.33
$13 \leq n \leq 39$ (odd harmonics only)	$3.85/n$	See 1. class A

PHENOMENA 4**CURRENT HARMONICS TEST DATA**

Unit draws ≤ 12 Watts and is exempt from this requirement.

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PHENOMENA 5

Flicker Test Limits per EN 61000-3-2

Parameter	Limit
Pst / Short term flicker	Less than or equal to 1
Plt / Long term flicker	Less than or equal to 0.65
Dc / Relative steady state voltage change	Less than 3%
Dmax / maximum relative voltage change	Less than 4%, shall not exceed 3% for more than 200ms

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PHENOMENA 5

FLICKER TEST RESULTS

Operating Voltage 230V $\pm$ 2% Single Phase

Operating Frequency : 50Hz $\pm$.5%

Total Supply Harmonic Distortion: Less than 3%

P_{1t} Observation Period: 2 hours

P_{st} Observation Period: 10 minutes

Measurements are made per EN 61000-3-2 section 4.2.1 using a flickermeter.

PLEASE SEE NEXT PAGE(S) FOR FLICKER TEST DATA

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PHENOMENA 5

FLICKER TEST DATA

EUT draws less than 12 watts and is not of a device type likely to cause flicker. EUT is exempt.

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PHENOMENA 6

CONDUCTED TEST LIMITS

Level	E1	E2	E3	E4	E5
Limit	0.15 - 0.5 MHz	66-56dBuV QP*		0.15 - 0.5MHz	79 dBuV QP
		56-46dBuV Avg*			66 dBuV Avg
	0.5 - 5 MHz	56 dBuV QP		0.5 - 30 MHz	73 dBuV QP
		46 dBuV Avg			60 dBuV Avg
	5 - 30 MHz	60 dBuV QP			
		50 dBuV Avg			

*The limit decreases linearly with the log of the frequency.

PHENOMENA 6

CONDUCTED TEST RESULTS

Frequency Range: 150 kHz to 30.0 MHz.
Bandwidth: 9 kHz per CISPR 16.1
Detector Functions: Peak, Quasi-Peak, Average
Table Height: 0.8 meters
Video Bandwidth: 30 kHz.

Phase 1 and Phase 2 Measurements Taken.

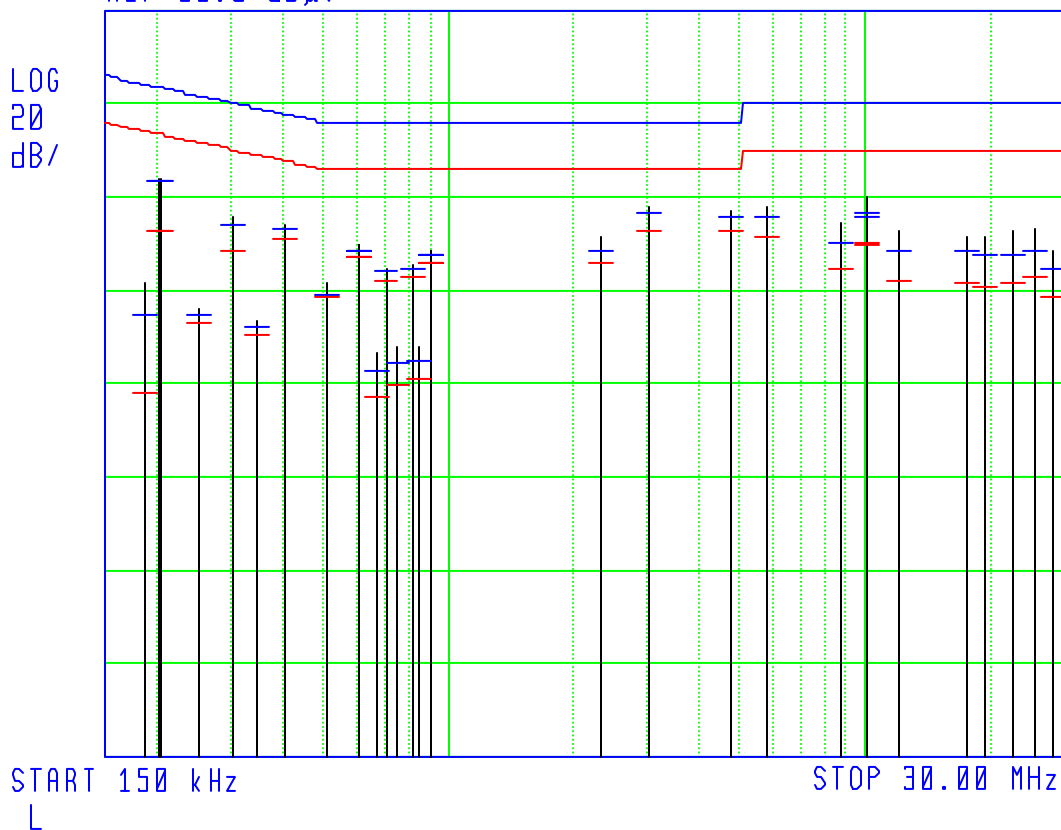
PLEASE SEE NEXT PAGE(S) FOR CONDUCTED TEST DATA

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PHENOMENA 6

Conducted 120V 60Hz Neutral Log Plot

08:59:19 DEC 04, 2003 120VAC 60HZ CON NEUTRAL
385-03 AUDIORAIL TECH ADAT RX32 TX32
REF 00.0 dB μ V



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PHENOMENA 6

Conducted 120V 60Hz Neutral Tabular Data

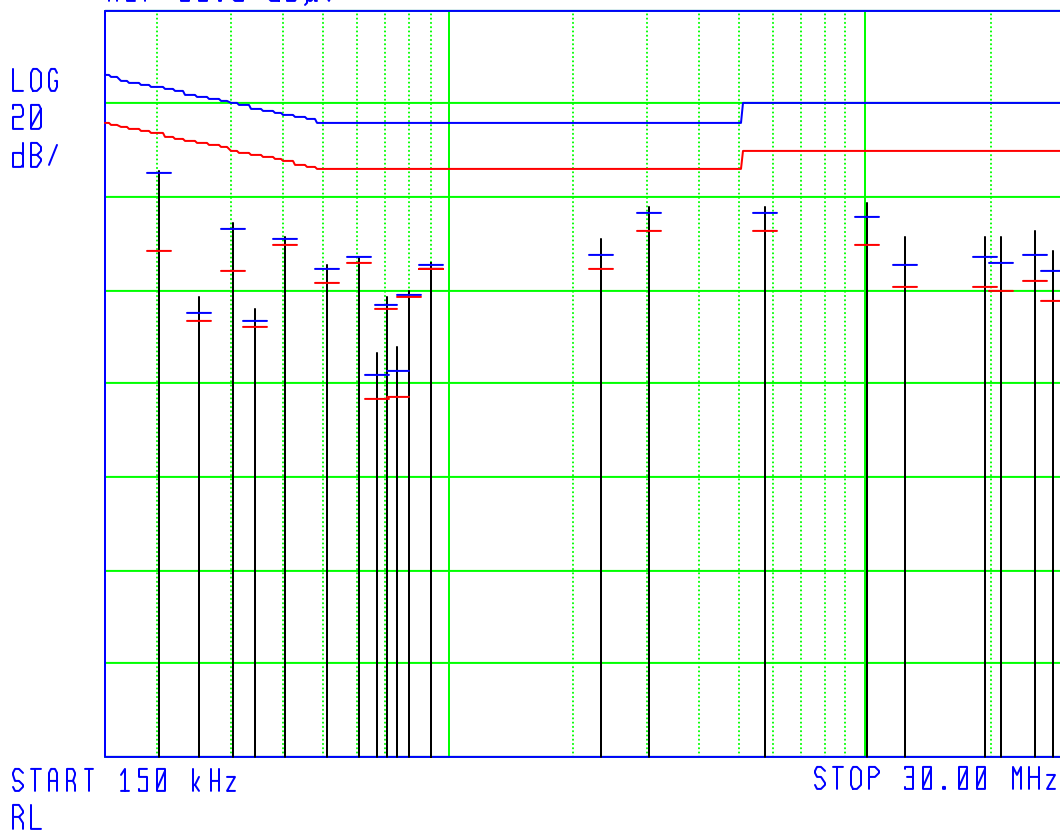
Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	Avg Amp (dBuV)	QP Limit (dBuV)	Avg Limit (dBuV)	QP Margin (dB)	Avg Margin (dB)
0.185943	21.98	14.97	-1.18	64.25	54.25	-49.28	-55.43
0.203196	44.60	43.90	32.96	63.53	53.53	-19.63	-20.57
0.203694	44.55	43.82	32.90	63.51	53.51	-19.69	-20.61
0.253030	16.02	14.58	13.56	61.70	51.70	-47.12	-38.14
0.304691	35.64	34.54	29.09	60.13	50.13	-25.59	-21.04
0.345314	14.33	12.60	11.28	59.14	49.14	-46.54	-37.86
0.406700	34.62	33.88	31.05	57.74	47.74	-23.86	-16.69
0.509081	21.74	19.87	18.67	56.00	46.00	-36.13	-27.33
0.609976	29.73	28.92	27.65	56.00	46.00	-27.08	-18.35
0.610885	29.77	28.87	27.62	56.00	46.00	-27.13	-18.38
0.667645	7.02	2.78	-2.64	56.00	46.00	-53.22	-48.64
0.711819	24.91	23.91	22.98	56.00	46.00	-32.09	-23.02
0.757915	8.55	4.37	0.23	56.00	46.00	-51.63	-45.77
0.814085	25.83	24.83	23.59	56.00	46.00	-31.17	-22.41
0.846933	8.38	5.15	1.82	56.00	46.00	-50.85	-44.18
0.915989	28.66	27.91	26.75	56.00	46.00	-28.09	-19.25
0.916134	28.76	27.96	26.81	56.00	46.00	-28.04	-19.19
2.340346	31.82	29.16	26.49	56.00	46.00	-26.84	-19.51
3.047053	38.00	36.38	32.87	56.00	46.00	-19.62	-13.13
4.742948	37.34	35.69	32.72	56.00	46.00	-20.31	-13.28
5.819658	37.95	35.92	31.74	60.00	50.00	-24.08	-18.26
8.750713	34.74	30.68	25.03	60.00	50.00	-29.32	-24.97
10.052230	38.31	35.65	29.55	60.00	50.00	-24.35	-20.45
10.151810	40.25	36.55	30.63	60.00	50.00	-23.45	-19.37
11.980785	32.46	29.09	22.43	60.00	50.00	-30.91	-27.57
17.504046	32.23	28.50	22.11	60.00	50.00	-31.50	-27.89
19.337259	32.19	27.74	21.37	60.00	50.00	-32.26	-28.63
22.718441	32.89	28.24	22.00	60.00	50.00	-31.76	-28.00
25.392654	33.57	28.84	23.17	60.00	50.00	-31.16	-26.83
28.092989	29.07	25.04	18.70	60.00	50.00	-34.96	-31.30

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PHENOMENA 6

Conducted 120V 60Hz Phase Log Plot

08:48:27 DEC 04, 2003 120VAC 60HZ CON PHASE
385-03 AUDIORAIL TECH ADAT RX32 TX32
REF 00.0 dB μ V



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PHENOMENA 6

Conducted 120V 60Hz Phase Tabular Data

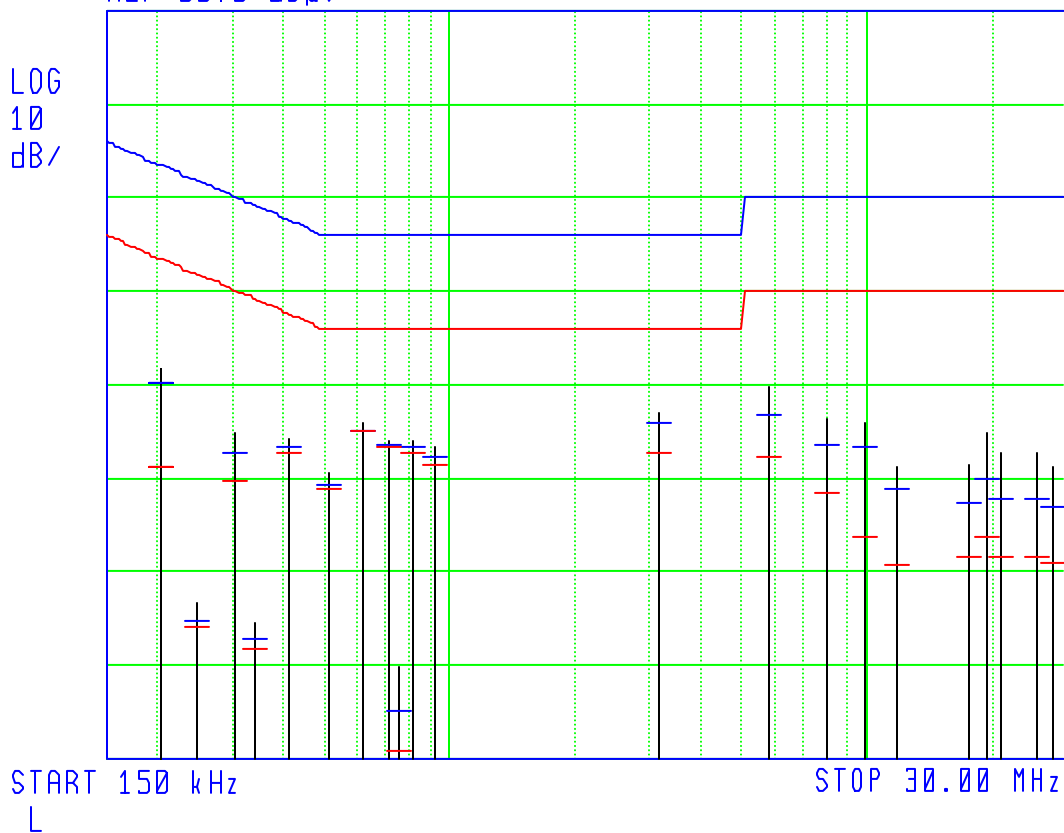
Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	Avg Amp (dBuV)	QP Limit (dBuV)	Avg Limit (dBuV)	QP Margin (dB)	Avg Margin (dB)
0.203155	45.70	45.01	28.94	63.53	53.53	-18.52	-24.59
0.251711	18.66	15.47	14.24	61.74	51.74	-46.27	-37.50
0.305106	34.84	33.76	23.98	60.12	50.12	-26.36	-26.14
0.342933	16.26	13.67	12.20	59.19	49.19	-45.52	-36.99
0.406063	32.18	31.36	30.03	57.76	47.76	-26.40	-17.73
0.507880	25.81	24.77	21.91	56.00	46.00	-31.23	-24.09
0.610669	27.70	26.93	26.52	56.00	46.00	-29.07	-19.48
0.669948	7.34	2.30	-3.11	56.00	46.00	-53.70	-49.11
0.711678	18.55	17.11	16.36	56.00	46.00	-38.89	-29.64
0.752440	8.22	3.02	-2.49	56.00	46.00	-52.98	-48.49
0.813688	20.54	19.36	18.61	56.00	46.00	-36.64	-27.39
0.915605	26.60	25.53	25.22	56.00	46.00	-30.47	-20.78
0.916336	26.30	25.33	25.02	56.00	46.00	-30.67	-20.98
2.337713	31.14	27.99	24.59	56.00	46.00	-28.01	-21.41
3.048403	38.15	36.40	32.76	56.00	46.00	-19.60	-13.24
5.726858	38.51	36.44	32.69	60.00	50.00	-23.56	-17.31
10.150720	38.72	36.01	29.33	60.00	50.00	-23.99	-20.67
12.483835	31.73	26.10	20.98	60.00	50.00	-33.90	-29.02
19.214819	32.04	27.15	20.91	60.00	50.00	-32.85	-29.09
21.277795	31.61	26.76	20.61	60.00	50.00	-33.24	-29.39
25.503965	33.16	28.32	23.00	60.00	50.00	-31.68	-27.00
28.157964	28.82	24.53	18.15	60.00	50.00	-35.47	-31.85

Test Number - 385-03

PHENOMENA 6

Conducted 230V 50Hz Neutral Log Plot

09:10:46 DEC 04, 2003 230VAC 50HZ CON NEUTRAL
385-03 AUDIORAIL TECH ADAT RX32 TX32
REF 80.0 dB μ V



Test Number - 385-03

PHENOMENA 6

Conducted 230V 50Hz Neutral Tabular Data

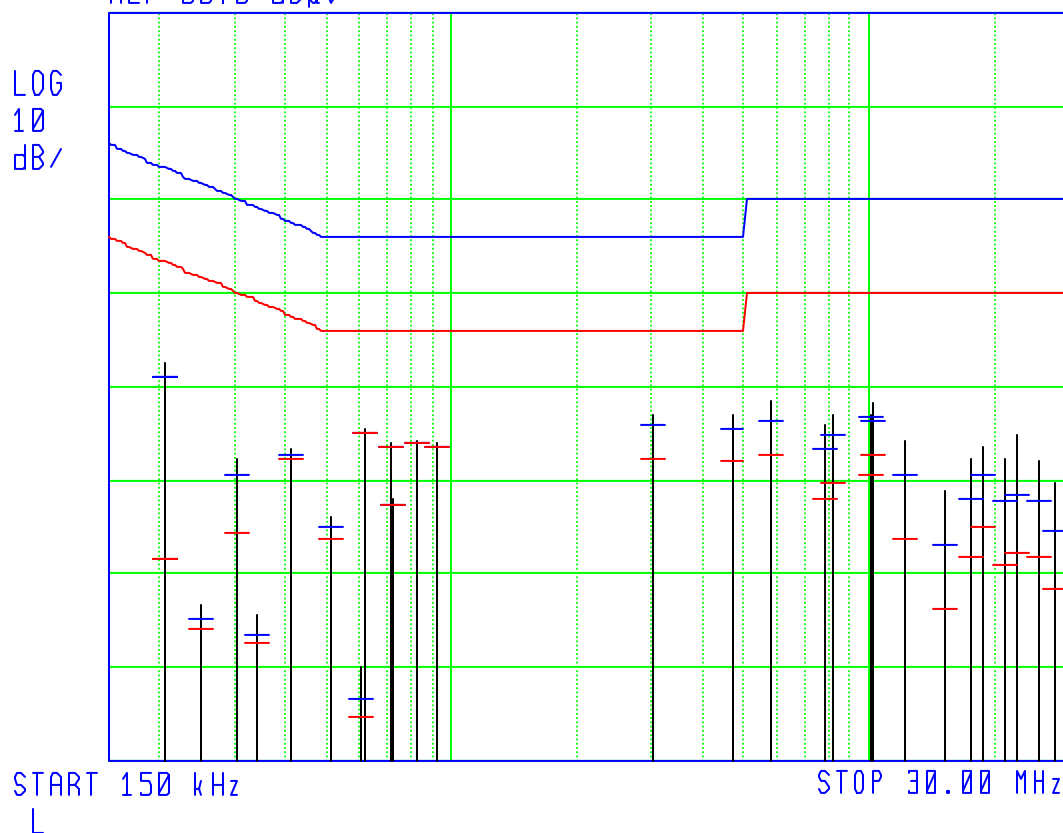
Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	Avg Amp (dBuV)	QP Limit (dBuV)	Avg Limit (dBuV)	QP Margin (dB)	Avg Margin (dB)
0.205024	41.86	40.45	31.23	63.46	53.46	-23.01	-22.23
0.205351	41.82	40.47	31.25	63.45	53.45	-22.98	-22.20
0.250998	16.79	15.11	14.16	61.76	51.76	-46.65	-37.60
0.307943	34.78	33.05	29.90	60.03	50.03	-26.98	-20.13
0.344796	14.56	12.93	11.71	59.15	49.15	-46.22	-37.44
0.412451	34.57	33.43	32.87	57.64	47.64	-24.21	-14.77
0.514120	30.81	29.46	29.17	56.00	46.00	-26.54	-16.83
0.617570	36.17	35.43	35.20	56.00	46.00	-20.57	-10.80
0.720330	34.29	33.60	33.22	56.00	46.00	-22.40	-12.78
0.754315	9.91	5.36	0.92	56.00	46.00	-50.64	-45.08
0.822923	34.12	33.39	32.86	56.00	46.00	-22.61	-13.14
0.926819	33.28	32.57	31.97	56.00	46.00	-23.43	-14.03
3.138439	37.32	36.23	32.89	56.00	46.00	-19.77	-13.11
5.771650	39.87	37.03	32.69	60.00	50.00	-22.97	-17.31
7.932106	36.42	33.70	28.66	60.00	50.00	-26.30	-21.34
9.847784	36.15	33.42	23.90	60.00	50.00	-26.58	-26.10
11.876666	31.52	29.22	20.83	60.00	50.00	-30.78	-29.17
17.622428	31.66	27.56	21.73	60.00	50.00	-32.44	-28.27
19.290279	34.89	30.28	23.92	60.00	50.00	-29.72	-26.08
20.869480	33.08	27.86	21.71	60.00	50.00	-32.14	-28.29
25.359033	32.82	28.07	21.66	60.00	50.00	-31.93	-28.34
28.001711	31.42	27.08	21.22	60.00	50.00	-32.92	-28.78

Test Number - 385-03

PHENOMENA 6

Conducted 230V 50Hz Phase Log Plot

09:19:35 DEC 04, 2003 230VAC 50HZ CON PHASE
3B5-03 AUDIORAIL TECH ADAT RX32 TX32
REF 00.0 dBμV



Test Number - 385-03

PHENOMENA 6

Conducted 230V 50Hz Phase Tabular Data

Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	Avg Amp (dBuV)	QP Limit (dBuV)	Avg Limit (dBuV)	QP Margin (dB)	Avg Margin (dB)
0.206400	42.58	41.36	21.54	63.41	53.41	-22.05	-31.87
0.206670	42.53	41.30	21.49	63.40	53.40	-22.10	-31.91
0.252970	17.03	15.32	14.33	61.70	51.70	-46.38	-37.37
0.308924	32.68	30.77	24.31	60.00	50.00	-29.23	-25.69
0.342819	15.63	13.85	12.68	59.19	49.19	-45.34	-36.51
0.412753	33.48	33.16	32.78	57.63	47.63	-24.47	-14.85
0.515320	26.50	25.06	23.82	56.00	46.00	-30.94	-22.18
0.605009	10.53	6.66	4.83	56.00	46.00	-49.34	-41.17
0.618930	35.64	35.35	35.25	56.00	46.00	-20.65	-10.75
0.722266	34.09	33.80	33.76	56.00	46.00	-22.20	-12.24
0.727500	28.28	27.41	27.33	56.00	46.00	-28.59	-18.67
0.825653	34.46	34.07	34.05	56.00	46.00	-21.93	-11.95
0.928526	34.24	33.71	33.62	56.00	46.00	-22.29	-12.38
3.046819	37.17	36.02	32.45	56.00	46.00	-19.98	-13.55
4.696820	37.39	35.54	32.21	56.00	46.00	-20.46	-13.79
5.819834	38.72	36.43	32.79	60.00	50.00	-23.57	-17.21
7.849159	36.06	33.55	28.13	60.00	50.00	-26.45	-21.87
8.158865	37.28	34.83	29.69	60.00	50.00	-25.17	-20.31
10.050765	37.44	36.93	30.59	60.00	50.00	-23.07	-19.41
10.154274	38.57	36.66	33.01	60.00	50.00	-23.34	-16.99
12.081903	34.52	30.48	24.11	60.00	50.00	-29.52	-25.89
15.262399	29.11	23.12	16.73	60.00	50.00	-36.88	-33.27
17.570371	32.76	28.45	22.03	60.00	50.00	-31.55	-27.97
18.690740	33.87	30.46	25.21	60.00	50.00	-29.54	-24.79
21.078411	32.62	27.88	21.39	60.00	50.00	-32.12	-28.61
22.662809	34.74	28.82	22.37	60.00	50.00	-31.18	-27.63
25.497760	32.08	28.02	22.12	60.00	50.00	-31.98	-27.88
28.065114	29.93	24.68	18.52	60.00	50.00	-35.32	-31.48

Test Number - 385-03

PHENOMENA 6

CONDUCTED EMISSIONS SETUP PHOTOS

Conducted Test Setup (Front)



Test Number - 385-03

PHENOMENA 6

CONDUCTED EMISSIONS SETUP PHOTOS

Conducted Test Setup (Rear)



Test Number - 385-03

PHENOMENA 7 through 9

Were not part of this investigation, Phenomena 7 and 9 do not apply to this EUT type and Phenomena 8 data will be provided by the manufacturer.

PHENOMENA 10

DC, COM AND SIGNAL PORT CONDUCTED TEST LIMITS

EN55103-1:1997 Test Limits

Level	E1	E2	E3	E4	E5
Limit	0.15 - 0.5 MHz	50-40dBuA QP*		0.15 - 0.5MHz	63-53 dBuA QP*
		40-30dBuA Avg*			53-43 dBuA Avg*
	0.5 - 30 MHz	40 dBuA QP		0.5 - 30 MHz	53 dBuA QP
		30 dBuA Avg			43 dBuA Avg

*The limit decreases linearly with the log of the frequency.

EN55022:1998 Class B Test Limits

Frequency MHz	Voltage Limit dBuV		Current Limit dBuA	
	Quasi Peak	Average	Quasi Peak	Average
0.150 - 0.5	84-74	74-64	40 - 30	30 - 20
0.5 - 30.0	74	64	30	20

The EUT was tested to meet the EN55022 limits above, these limits are more stringent than those found in EN55103-1. It is accepted in the methods of EN55022, that if an EUT meets the voltage limits, then it will also comply with the Current limits. The test was conducted using the 4 wire CDN described in EN55022. EN55103-1 indicates to use the methods described by EN55022. The EUT therefore is deemed to comply with EN55103-1:1997.

Test Number - 385-03

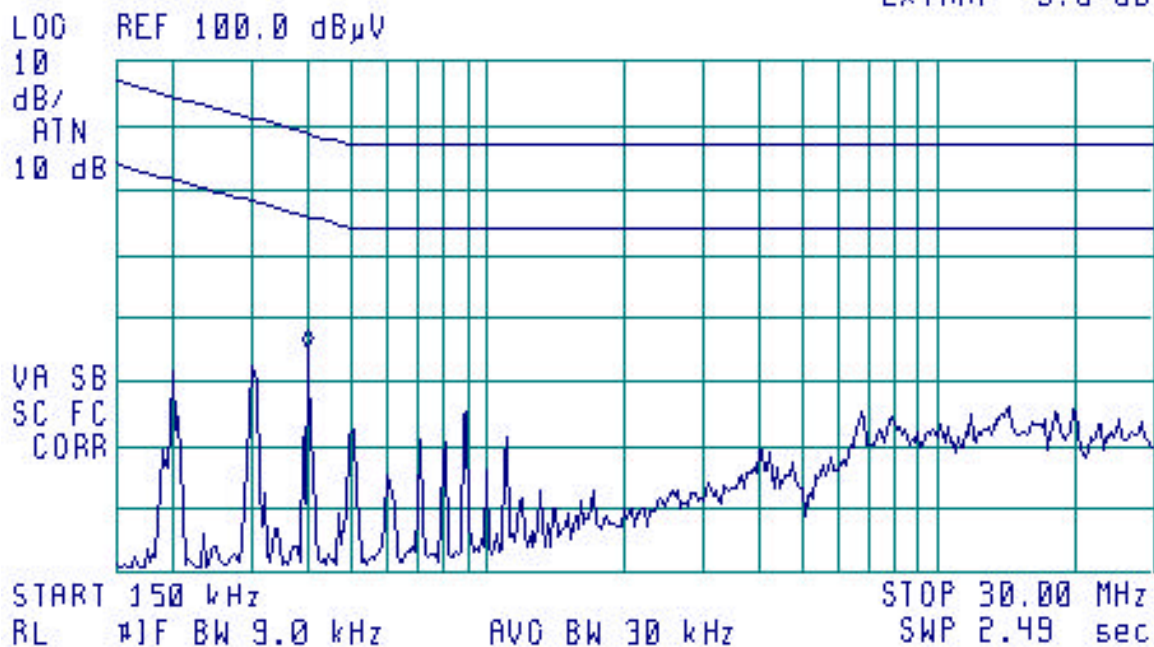
PHENOMENA 10

Port Conducted Emissions Data

13:31:08 DEC 09, 2003 PCO PORT CONDUCTED LEFT SIDE
TEST#385-03 AUDIO RAIL ADAT RX32 TX32

FREQ 403.6 kHz
PEAK 55.3 dBμV
QP 54.8 dBμV
AVC 43.8 dBμV

EXTAMP -9.6 dB



Test Number - 385-03

PHENOMENA 10

Port Conducted Emissions Data

13:28:10 DEC 09, 2003 TELCO PORT CONDUCTED RT S14
TEST#385-03 AUDIO RAIL ADAT RX32 TX32

FREQ 403.0 kHz
PEAK 54.7 dBμV
QP 54.1 dBμV
AVG 43.2 dBμV

EXTAMP -9.6 dB

LOC REF 100.0 dBμV

10
dB/
ATN
10 dB

VA SB
SC FC
CORR

START 150 kHz

RL #1F BW 9.0 kHz

AVG BW 30 kHz

STOP 30.00 MHz

SWP 2.49 sec

PHENOMENA 10

PORT CONDUCTED EMISSIONS SETUP PHOTOS



Test Number - 385-03

NOTES AND COMMENTS

(Special conditions unique to this test)

None.

Part 15 Class B Manual Statement

The following statement should be conspicuously located in bold letters in the instruction manual:

RADIO AND TELEVISION INTERFERENCE

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

You may also find helpful the following booklet, prepared by the FCC: "How to Identify and Resolve Radio-TV Interference Problems." This booklet is available from the U.S. Government Printing Office, Washington D.C. 20402.

Changes and Modifications not expressly approved by the manufacturer or registrant of this equipment can void your authority to operate this equipment under Federal Communications Commissions rules.

* In order to maintain compliance with FCC regulations shielded cables must be used with this equipment. Operation with non-approved equipment or unshielded cables is likely to result in interference to radio & television reception.

* NOTE: If shielded cables were used when testing your product you must also add this paragraph to the manual

Part 15 Class B Label

This device complies with part 15 of FCC Rules. Operation is subject to the following two conditions; (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

IC ES 003 Label

This Class (*) digital apparatus complies with Canadian ICES-003
Cet appareil numérique de la classe (*) est conforme à la norme
NMB-003 du Canada

(*) Insert either "A" or "B" but not both as appropriate for the
equipment requirements