TEST REPORT NUMBER - 387-03

EN 55103-2:1997 PRODUCT FAMILY STANDARD FOR AUDIO, VIDEO, AUDIO-VISUAL AND ENTERTAINMENT LIGHTING CONTROL APPARATUS FOR PROFESSIONAL USE—IMMUNITY

EN 61000-4-2 ELECTROSTATIC DISCHARGE IMMUNITY
EN 61000-4-3 RADIATED RADIO FREQUENCY (RF) IMMUNITY
EN 61000-4-4 ELECTRICAL FAST TRANSIENT/BURST IMMUNITY
EN 61000-4-5 SURGE IMMUNITY
EN 61000-4-6 CONDUCTED RF DISTURBANCE IMMUNITY
EN 61000-4-11 VOLTAGE DIPS INTERRUPTIONS AND VARIATIONS

for

AudioRail Technologies
3 Silver Hill Rd.
Maynard, MA
978-461-1744

of

4x ADAT Lightpipe over CAT5 Network

ADAT rx32tx32

on

December 5th to 10th, 2003

Tested by

_____
Robert J. McCall

Reviewed by

_____
Larry K. Stillings

TABLE OF CONTENTS

1.0 OVERVIEW

1.1 PURPOSE OF TEST

This report has been compiled to document the Immunity (Susceptibility) test parameters, effects and results of the 4x ADAT Lightpipe over CAT5 NetworkADAT rx32tx32 in comparison to the requirements for equipment as specified in the documents listed below. 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.

89/336/EEC (3 May 1989)	Official Journal of the European Communities Council Directive on Electromagnetic Compatibility
91/31/EEC (28 April 1992)	Official Journal of the European Communities Amending Directive 89/336/EEC on: Council Directive on Electromagnetic Compatibility
EN50082-1 (1997-08)	Electromagnetic Compatibility - Generic Immunity Standard Part 1: Residential, commercial and light industry
EN 61000-6-1 (2001)	Electromagnetic Compatibility - Generic Immunity Standard Part 6-1: Residential, commercial and light industry
EN55103-2 (April 1997)	Electromagnetic Compatibility – Product family standard for audio, video, audio-visual and entertainment lightning control apparatus for professional use

1.1 OVERVIEW

1.1 PURPOSE OF TEST (cont.)

EN61000-4-2 (1995-01)	Electromagnetic Compatibility (EMC) Part 4: Testing and measurement techniques - Section 2 Electrostatic Discharge Immunity Test
EN61000-4-2 (1998)	Electromagnetic Compatibility (EMC) Amendment A1
EN61000-4-3 (1995-02)	Electromagnetic Compatibility (EMC) Part 4: Testing and measurement techniques - Section 3 Radiated, Radio-Frequency Immunity Test
EN61000-4-4 (1995-01)	Electromagnetic Compatibility (EMC) Part 4: Testing and measurement techniques - Section 4 Electrical Fast Transient/Burst Immunity Test
EN61000-4-5 (1995-02)	Electromagnetic Compatibility (EMC) Part 5 Testing and measurement techniques - Section 5 Surge Immunity Test
EN61000-4-6 (1996-03)	Electromagnetic Compatibility (EMC) Part 6: Testing and measurement techniques - Section 6 Immunity to conducted disturbances, induced by Radio frequency fields.
EN61000-4-11(1994-06)	Electromagnetic Compatibility (EMC) Part 11: Testing and measurement techniques - Section Voltage dips, short interruptions and voltage Variations immunity Test

1.2 Product Identification

Type: 4x ADAT Lightpipe over CAT5 Network

Model: ADAT rx32tx32

S/N: 3

Input power: 230 VAC 50 Hz

Power Supplies

Manufacturer: V-Infinity

Model Number: VPS-25-3.3

Application Software: EUT does not use software.

1.2 Product Identification (Continued):

Support Equipment:

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

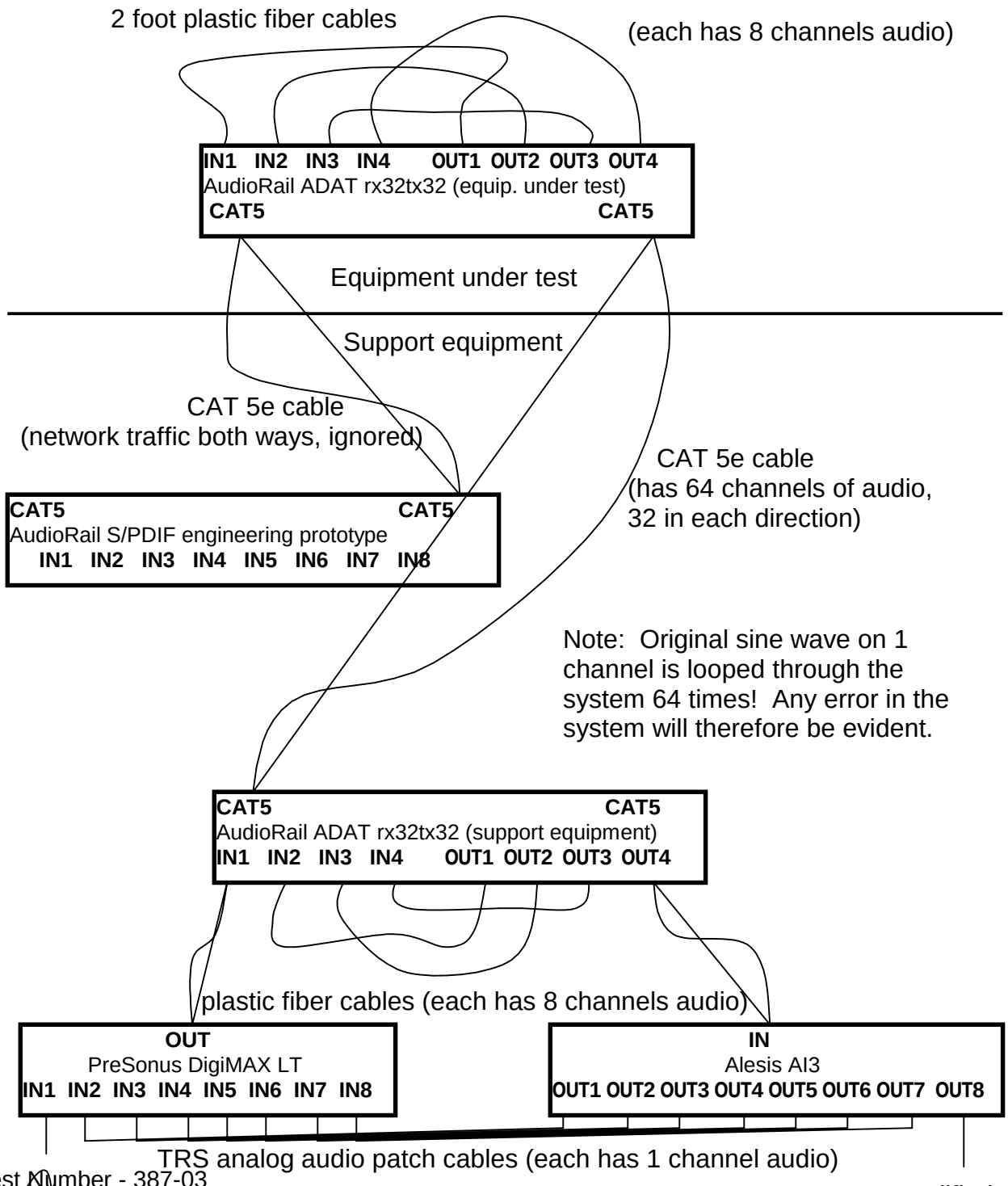
Boom Box
55Hz Sine wave generator

Cables:

TYPE	QUANTITY	LENGTH	SHIELDING
Optical cables	4	.6 meters	no
UTP Cat 5	2	50 meters	no
STP Cat 5 (CRFI)	2	30 meters	yes

Modifications performed on product at test facility: Shielded Cat 5 cable was used to raise CRFI levels from 3V to 10V, to meet E5 environments criteria.

1.3 BLOCK DIAGRAM



2.0 EN 61000-4-2 ELECTROSTATIC DISCHARGE TEST DESCRIPTION

2.1 TEST SETUP

The EUT setup was placed in the ESD test laboratory in accordance with the IEC standard, with the following climatic conditions:

Temperature: 15.1 degrees C

Relative Humidity: 25 %

The EUT was connected as diagrammed in Section 1.0 of this report.

A horizontal coupling plane (HCP) was placed on a non-conductive table, 0,8 meters above the ground plane and connected to the ground plane through two 470-kohm resistors. The EUT was placed on the table with an insulating support between the EUT and the HCP. The ESD simulator was charged and allowed to discharge through the HCP See section 9 for photographs of typical setups.

A vertical coupling plane (VCP) measuring 0,5m by 0,5m was fixed 0,1m from the vertical surfaces of the equipment, parallel to them and connected to the ground plane through two series 470 kohm resistors. The ESD simulator was charged and allowed to discharge to the VCP. This test was repeated until all vertical surface areas of the EUT were exposed to the VCP.

The ESD events were applied to such points and surfaces of the EUT that are normally accessible to the operator for normal operation or maintenance. Contact discharge is the preferred test method. Air discharges are used where contact discharge cannot be applied.

NOTES:

1. See Section 1, for ESD test locations.

2.2 TEST RESULTS

The 4x ADAT Lightpipe over CAT5 Network ADAT rx32tx32 meets the requirements set forth in EN 61000-4-2. Detailed test results are found in the following table(s).

2.3 TEST DATA

The test results are based upon 10 discharges at both polarities at each test point

Contact Discharge Data

PERFORMANCE CATEGORY

VOLTAGE=>	**Level 1** 2K V		**Level 2** 4K V		**Level 3** 6K V		**Level 4** 8K V	
Position Key	+	-	+	-	+	-	+	-
1	2	2	2	2				
2	2	2	2	2				
3	2	2	2	2				
4	2	2	2	2				
5	2	2	2	2				
6	2	2	2	2				
7	2	2	2	2				
8	2	2	2	2				
9	2	2	2	2				
10								
11								
12								
13								
14								
15								

Indirect Discharge

PERFORMANCE CATEGORY

VOLTAGE=>	**Level 1** 2K V		**Level 2** 4K V		**Level 3** 6K V		**Level 4** 8K V	
Coupling Plane Orientation	+	-	+	-	+	-	+	-
Horizontal (table top)	2	2	2	2				
Vertical (Front)	2	2	2	2				
Vertical (Left)	2	2	2	2				
Vertical (Rear)	2	2	2	2				
Vertical (Right)	2	2	2	2				

2.3 TEST DATA (Continued)

Air Discharge Data: Not applicable

PERFORMANCE CATEGORY

	Level 1		**Level 2**		**Level 3**		**Level 4**	
VOLTAGE=>	2K V		4K V		8K V		15K V	
Position Key	+	-	+	-	+	-	+	-
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

PERFORMANCE CATEGORY EXPLAINATION

Category 1 - Normal Performance within specified limits.
Monitored 55Hz Audio output is OK

Category 2 - Temporary loss of function that is self-recoverable.
Crackling Audio noise during test.

Category 3 - Temporary loss of function requires operator intervention

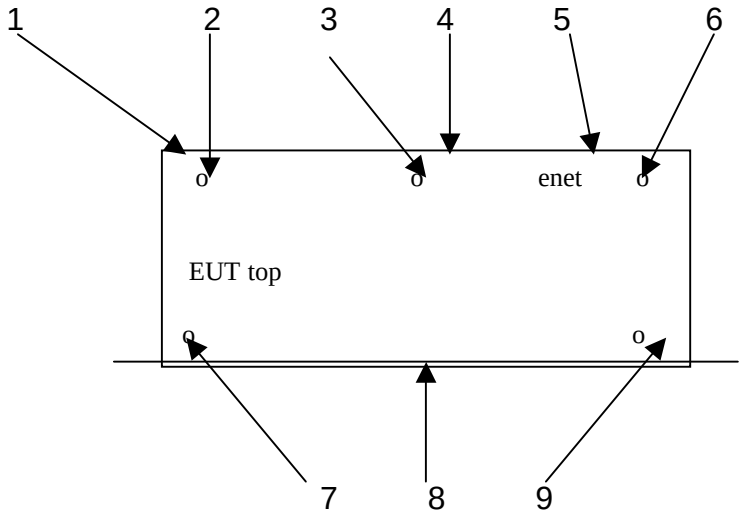
Category 4 - Loss of function which is not recoverable and is due to a damaged EUT

2.4 TEST EQUIPMENT

	Equipment	Serial #	Last Calibration	Calibration Due
*	Haefely PSD 25B	082 197-25	4-28-2003	4-28-2004
	Haefely Contact Probe	082 213-09	4-28-2003	4-28-2004

All equipment used for testing has been calibrated according to the methods and procedures defined by the National Institute of Standards and Technology (NIST).

2.5 TEST POINT DIAGRAM



2.6 ELECTROSTATIC DISCHARGE PHOTOGRAPHS

3.0 EN 61000-4-3 RADIATED RADIO-FREQUENCY TEST DESCRIPTION

3.1 TEST SETUP

The EUT setup was placed in the ferrite tile chamber in accordance with the IEC standard, with the following climatic conditions:

Temperature: 19.0 degrees C

Relative Humidity: 23 %

The EUT was connected as diagrammed in Section 1.0 of this report. All testing and verification for EUT operation was monitored utilizing the color camera system contained in the chamber and/or external peripheral equipment located outside of the chamber. The customer was not present during testing.

3.2 TEST RESULTS

The 4x ADAT Lightpipe over CAT5 Network ADAT rx32tx32 meets the requirements set forth in EN 61000-4-3.

3.3 TEST DATA

SIDE OF EUT	POLARITY (H / V)	FREQUENCY (MHz)	VOLTS PER METER	1kHz 80% AM	PERFORMANCE CATEGORY
FRONT	V	80 - 1000	10	YES	A
FRONT	H	80 - 1000	10	YES	A
LEFT	V	80 - 1000	10	YES	A
LEFT	H	80 - 1000	10	YES	A
RIGHT	V	80 - 1000	10	YES	A
RIGHT	H	80 - 1000	10	YES	A
BACK	V	80- 1000	10	YES	A
BACK	H	80 - 1000	10	YES	A

PERFORMANCE CATEGORY EXPLAINATION

Category A - Normal Performance within specified limits.
Monitored 55Hz Audio output is OK

Category B - Temporary loss of function that is self-recoverable.

Category C - Temporary loss of function requires operator intervention

Category D - Loss of function which is not recoverable and is due to a damaged EUT

3.4 TEST EQUIPMENT

Equipment	Serial #	Last Calibration	Calibration Due
Chamber 3v/m Uniform Field	---	Verified	N/A
Chamber 10v/m Uniform Field	---	Verified	N/A
Chase CBL6121A BiConilog	1015	Verified	N/A
EMCO 3143 Log Periodic Ant	9112-1046	Verified	N/A
EMCO 7120 E Field Sensor	9208-1318	Verified	N/A
Fluke 6060A Generator	3775031	Verified	N/A
HP 8690 w/8699B Plugin	937-01247	Verified	N/A
Hughes TWT Amplifier 1177H	103	Verified	N/A
IFI LPA-5B Leveling PreAmplifier	806-1095	Verified	N/A
IFI SMX100 Wideband Amplifier	803-1095	Verified	N/A
IFI E Field Sensor EFS5	807	Verified	N/A
IFI E Field Sensor EFS5	808	Verified	Verified
Narda E-Field Probe 8760	9022	Verified	Verified
Narda E-Field Probe 8760	9025	Verified	N/A

All equipment used for testing has been calibrated according to the methods and procedures defined by the National Institute of Standards and Technology (NIST).

3.5 RADIATED RADIO FREQUENCY PHOTOGRAPHS

4.0 EN 61000-4-4 ELECTRICAL FAST TRANSIENT/BURST TEST DESCRIPTION

4.1 TEST SETUP

The EUT setup was placed in the EFT test laboratory in accordance with the IEC standard, with the following climatic conditions:

Temperature: 14.9 degrees C

Relative Humidity: 30 %

The EUT was connected as diagrammed in Section 1.0 of this report. All testing and verification for EUT operation was monitored utilizing the camera system located in the chamber and/or peripheral equipment located outside of the chamber. The customer was present during testing.

The EFT events were applied to such the Mains and to cables at each I/O port of the EUT that are normally accessible to the operator for normal operation or maintenance.

NOTES:

1. See Section 1.0, for the block diagram of the EUT setup.

4.2 TEST RESULTS

The 4x ADAT Lightpipe over CAT5 Network ADAT rx32tx32 meets the requirements set forth in EN 61000-4-4. Detailed test results are found in the following table(s).

4.3 TEST DATA

POWER PERFORMANCE CATEGORY

		Level 1	Level 2	Level 3	Level 4
	VOLTAGE=>	0.5KV	1KV	2KV	4KV
Line	Polarity				
N	+	2	2	2	
N	-	2	2	2	
L	+	2	2	2	
L	-	2	2	2	
PE	+	2	2	2	
PE	-	2	2	2	

I/O PERFORMANCE CATEGORY

		Level 1	Level 2	Level 3	Level 4
	VOLTAGE=>	0.25KV	0.5KV	1KV	2KV
I/O or Group	Polarity				
Group	+	1	1	2	
Group	-	1	1	2	
	+				
	-				

PERFORMANCE CATEGORY EXPLAINATION

Category 1 - Normal Performance within specified limits.
Monitored 55Hz Audio Sine Wave output is OK

Category 2 - Temporary loss of function that is self-recoverable.
Crackling Audio noise during test.

Category 3 - Temporary loss of function requires operator intervention

Category 4 - Loss of function which is not recoverable and is due to a damaged EUT

4.4 TEST EQUIPMENT

Equipment	Serial #	Last Calibration	Calibration Due
Haefely PEFT.1	081-944-23	2-6-2003	2-6-2004
Haefely Coupling Clamp IP4A	082 148-17	Verified	N/A

All equipment used for testing has been calibrated according to the methods and procedures defined by the National Institute of Standards and Technology (NIST).

4.5 ELECTRICAL FAST TRANSIENT/BURST PHOTOGRAPHS

5.0 EN 61000-4-5 SURGE IMMUNITY TEST DESCRIPTION

5.1 TEST SETUP

The EUT setup was placed in the Surge test laboratory in accordance with the IEC standard, with the following climatic conditions:

Temperature: 20.5 Degrees C

Relative Humidity: 22 %

The EUT was connected as diagrammed in Section 1.0 of this report. All testing and verification for EUT operation was monitored. The customer was / was not present during testing.

The Surge events were applied to the Mains of the EUT. The mains power was supplied from a 50Hz 230 VAC source.

NOTES:

1. See Section 1, for the block diagram of the EUT setup.

5.2 TEST RESULTS

The 4x ADAT Lightpipe over CAT5 NetworkADAT rx32tx32 meets the requirements set forth in EN 61000-4-5. Detailed test results are found in the following table(s).

5.3 TEST DATA

SURGE PERFORMANCE CATEGORY

		Level 1	Level 2	Level 3	Level 4
	VOLTAGE=>	0.5KV	1KV	2KV	4KV
Line	Polarity				
L-PE	+	1	1	1	
L-PE	-	1	1	1	
N-PE	+	1	1	1	
N-PE	-	1	1	1	
L-N	+	1	---	---	
L-N	-	1	---	---	

PERFORMANCE CATEGORY

Category 1 - Normal Performance within specified limits.
Monitored 55 Hz Audio is OK.

Category 2 - Temporary loss of function that is self-recoverable.

Category 3 - Temporary loss of function requires operator intervention

Category 4 - Loss of function which is not recoverable and is due to a damaged EUT

5.4 TEST EQUIPMENT

Equipment	Serial #	Last Calibration	Calibration Due
Haefely P-Surge 4.1	083-061-06	3-10-2003	3-10-2004
Keytek CEMaster	9704225	12-13-2002	12-13-2003

All equipment used for testing has been calibrated according to the methods and procedures defined by the National Institute of Standards and Technology (NIST).

5.5 SURGE IMMUNITY PHOTOGRAPHSS

6.0 EN 61000-4-6 CONDUCTED DISTURBANCE RADIO-FREQUENCY TEST DESCRIPTION

6.1 SETUP

The EUT setup was placed in the ferrite tile chamber in accordance with the IEC standard, with the following climatic conditions:

Temperature: 20.5 degrees C

Relative Humidity: 23 %

The EUT was connected as diagrammed in Section 1.0 of this report. All testing and verification for EUT operation was monitored utilizing the color camera system contained in the chamber and/or external peripheral equipment located outside of the chamber. The customer was present during testing.

6.2 TEST RESULTS

The 4x ADAT Lightpipe over CAT5 Network ADAT rx32tx32 meets the requirements set forth in EN 61000-4-6.

Shielded Cat 5 cable was used to raise CRFI levels from 3V to 10V, to meet E5 environments criteria.

6.3 TEST DATA

CDN-M3 3 WIRE POWER INJECTION

FREQUENCY (MHz)	VOLTS PER METER	1kHz 80% AM	PERFORMANCE CATEGORY
.15-80	10	YES	A

Non Signal UTP 'B' CDN-T400 UNSCREENED CABLE

FREQUENCY (MHz)	VOLTS PER METER	1kHz 80% AM	PERFORMANCE CATEGORY
.15-80	3	YES	A

Signal UTP 'A' CDN-T400 UNSCREENED CABLE

FREQUENCY (MHz)	VOLTS PER METER	1kHz 80% AM	PERFORMANCE CATEGORY
.15-80	3	YES	A

Non Signal STP 'B' CDN-S1 SCREENED CABLE INDUCED

FREQUENCY (MHz)	VOLTS PER METER	1kHz 80% AM	PERFORMANCE CATEGORY
.15-80	10	YES	A

Signal STP 'A' CDN-S1 SCREENED CABLE INDUCED

FREQUENCY (MHz)	VOLTS PER METER	1kHz 80% AM	PERFORMANCE CATEGORY
.15-80	10	YES	A

PERFORMANCE CATEGORY EXPLAINATION

Category A - Normal Performance within specified limits.
Monitored 55 Hz Audio is OK.

Category B - Temporary loss of function that is self-recoverable.

Category C - Temporary loss of function requires operator intervention

Category D - Loss of function which is not recoverable and is due to a damaged EUT

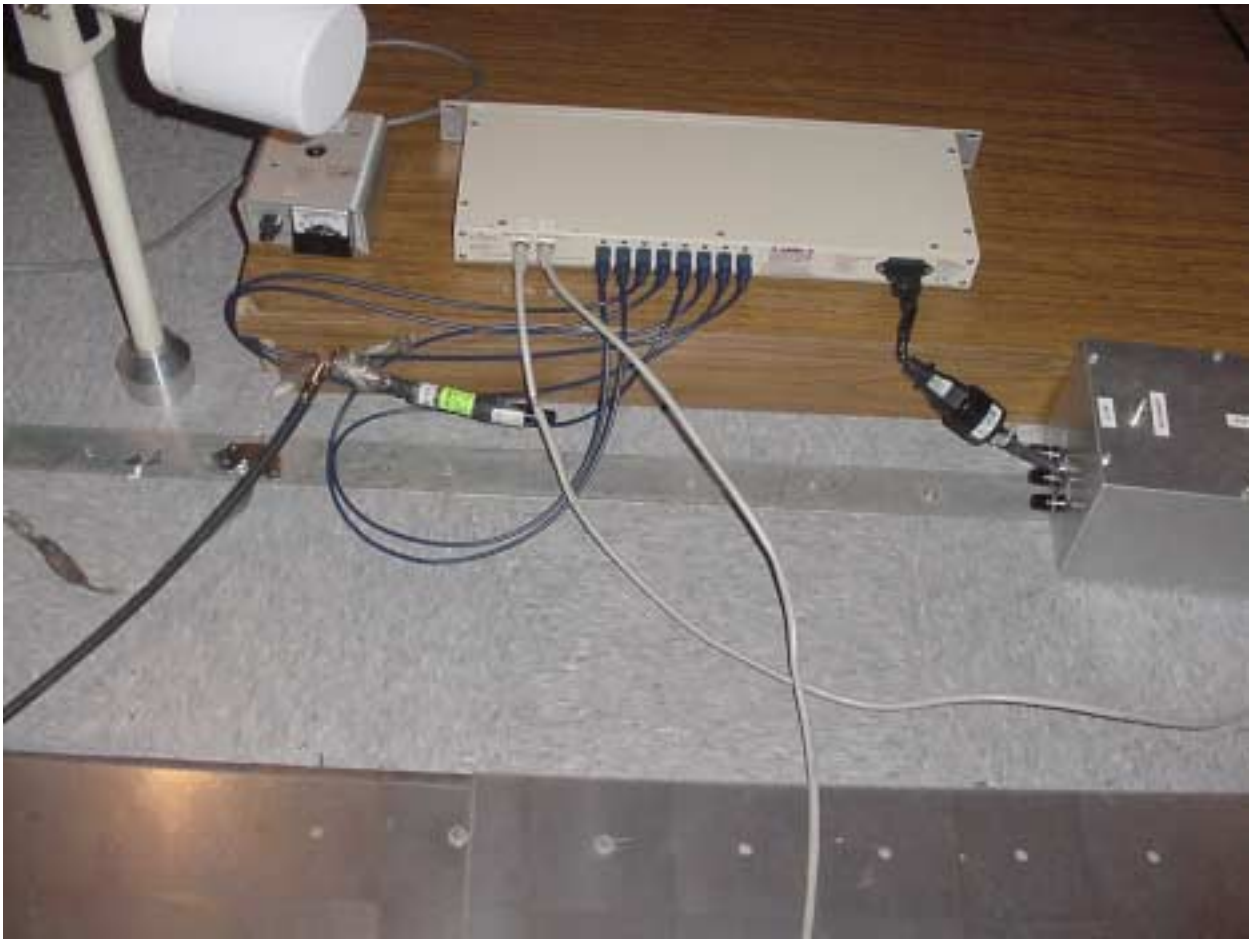
6.4 TEST EQUIPMENT

Equipment	Serial #	Last Calibration	Calibration Due
Fluke 6060A Generator	3775031	1-06-03	1-06-04
IFI LPA-5B Leveling PreAmplifier	806-1095	Verified	N/A
IFI SMX100 Wideband Amplifier	803-1095	Verified	N/A
CW-CDN-M3	CW001	1-13-03	1-13-04
CW-CDN-S1 (100 ohm)	CW001	1-13-03	1-13-04
CW-CDN-T2	CW001	Verified	N/A
CW-CDN-AF3	CW001	Verified	N/A
Fischer FCC-801-M2-16A	2027	1-10-03	1-10-04
Fischer Bulk Current F-120-9A	293	1-13-03	1-13-04
Schaffner CDN-T400	16901	Verified	Verified

All equipment used for testing has been calibrated according to the methods and procedures defined by the National Institute of Standards and Technology (NIST).

6.5 POWER CONDUCTED RADIO FREQUENCY PHOTOGRAPHS

6.6 POWER CONDUCTED RADIO FREQUENCY PHOTOGRAPHS



7.0 RADIATED MAGNETIC FIELD TEST DESCRIPTION

7.1 SETUP

The EUT setup was placed within the homogeneous field of a Helmholtz coil 1 meter away from all conducting surfaces in accordance with the IEC standard, with the following climatic conditions:

Temperature: 13.1 degrees C

Relative Humidity: 25 %

The EUT was connected as diagrammed in Section 1.0 of this report. All testing and verification for EUT operation was monitored directly or indirectly via peripheral equipment located outside of the coil. The EUT was turned to position it in 3 orthogonal axis. The customer was not present during testing.

7.2 TEST RESULTS

The 4x ADAT Lightpipe over CAT5 NetworkADAT rx32tx32 meets the requirements set forth in EN 55103-2.

7.3 TEST DATA

MAGNETIC FIELD TEST DATA

FREQUENCY (KHz)	AMPS PER METER	(PH) PSEUDO-HOMOGENEOUS or (H) HOMOGENEOUS	PERFORMANCE CATEGORY
.05-5	10-.1	H	A
5-10	.1	H	A

PERFORMANCE CATEGORY EXPLAINATION

Category A - Normal Performance within specified limits.
Monitored 55 Hz Audio is OK.

Category B - Temporary loss of function that is self-recoverable.

Category C - Temporary loss of function requires operator intervention

Category D - Loss of function which is not recoverable and is due to a damaged EUT

7.4 TEST EQUIPMENT

Equipment	Serial #	Last Calibration	Calibration Due
HP Function Generator 3325A	2512A20263	Verified	N/A
ADCOM Stereo Amp GFA535-II	AP13138135	Verified	N/A
MagShield AC Field Evaluator	001	Verified	N/A
Tektronix 2230 O-Scope	B031344	Verified	N/A

All equipment used for testing has been calibrated according to the methods and procedures defined by the National Institute of Standards and Technology (NIST).

7.5 RADIATED MAGNETIC FIELD PHOTOGRAPHS

11.0 EN 61000-4-11 VOLTAGE DIPS, SHORT INTERRUPTIONS, VARIATIONS

11.1 TEST SETUP

The EUT setup was placed in the test laboratory in accordance with the IEC standard, with the following climatic conditions:

Temperature: 21.8 degrees C

Relative Humidity: 23 %

The EUT was connected as diagrammed in Section 1.0 of this report. All testing and verification for EUT operation was monitored. The customer was not present during testing.

The Voltage dips and interruptions were applied to the Mains of the EUT. The mains power was supplied from a 50 Hz 230 VAC source.

NOTES:

1. See Section 1, for the block diagram of the EUT setup.

11.2 TEST RESULTS

The 4x ADAT Lightpipe over CAT5 NetworkADAT rx32tx32meets the requirements set forth in EN 61000-4-11. Detailed test results are found in the following table(s).

11.3 TEST DATA

VOLTAGE DIPS PERFORMANCE CATEGORY

% REDUCTION	PERIOD	START POINT (DEGREES)	REPETITIONS	PERFORMANCE CATEGORY
100	1	0 AND 180	3	1
40	5	0 AND 180	3	1
>95	250	0 AND 180	3	2

Mains Voltage and Frequency : 230VAC, 50 Hz

PERFORMANCE CATEGORY EXPLAINATION

Category 1 - Normal Performance within specified limits.
Monitored 55 Hz Audio is OK.

Category 2 - Temporary loss of function that is self-recoverable.
Monitored signal returns with power.

Category 3 - Temporary loss of function requires operator intervention

Category 4 - Loss of function which is not recoverable and is due to a damaged EUT

11.4 TEST EQUIPMENT

Equipment	Serial #	Last Calibration	Calibration Due
Keytek CEMaster	9704225	12/13/2002	12/13/2003

All equipment used for testing has been calibrated according to the methods and procedures defined by the National Institute of Standards and Technology (NIST).

11.5 VOLTAGE DIPS AND INTERRUPTS PHOTO