Marlboro Test Labs
integrated quality services

55 Fairbanks Boulevard
Marlboro, MA 01752-1298 USA

Telephone (508) 460-1400
Facsimile (508) 460-7979

EN50082-1 IMMUNITY TEST REPORT

Applicant:	Advanced Fiber Solutions 45 Franklin Street Milton, MA 02186
Equipment Under Test:	Fiber Optic Cable Tester OM120 / OS420 / OS430
Test Location:	Marlboro Test Labs
Test Dates:	October 23, 2002 November 5, 2002

EN61000-4-2 (Electrostatic Discharge) - Passed
EN61000-4-3 (Radiated Immunity)- Passed

This product complies with the requirements of EN50082-1.
Please refer to attached individual reports for detailed testing results.

Reviewed by: ______________________
L. Brunk
Lab Manager

ESD110502

Marlboro Test Labs
iqs integrated quality services

EN 61000-4-2 (1998) Electrostatic Discharge Test Report

Applicant:	Advanced Fiber Solutions 45 Franklin Street Milton, MA 02186
Equipment Under Test:	Fiber Optic Cable Tester OM120 / OS420
Test Location:	Marlboro Test Labs 55 Fairbanks Boulevard Marlboro, MA 01752-1298
Test Date:	November 5, 2002

This report contains the results of an investigation of the product tested and is representative of the properties of similar products. This report may only be used to document the EN 61000-4-2 testing herein and may only be reproduced in full. Any distribution of the information contained in this report requires prior approval from Advanced Fiber Solutions.

Tested & Reviewed By: ______________________
R. Roberts
Test Engineer

Reviewed By: ______________________
L. Brunk
Lab Manager

TABLE OF CONTENTS

1.0 OVERVIEW

This report has been compiled to document the Electro-Static Discharge test parameters, effects and results of the Advanced Fiber Solutions' Fiber Optic Cable Tester, OM120 / OS420, in comparison to the requirements for equipment, as specified in the following documents:

89/336/EEC (3 May 1989)	Official Journal of the European Communities Council Directive on Electromagnetic Compatibility
92/31/EEC (28 April 1992)	Official Journal of the European Communities Amending Directive 89/336/EEC on: Council Directive on Electromagnetic Compatibility
EN50082-1 (January 1997)	Electromagnetic Compatibility - Generic Immunity Standard Part 1: Residential, commercial and light industry
EN55024 (1998)	Information technology equipment – Immunity characteristics – Limits and methods of measurement
EN61000-4-2 (1998)	Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques - Section 2: Electrostatic discharge immunity test

2.0 PRODUCT IDENTIFICATION

Equipment Under Test:

Type: Fiber Optic Cable Tester
Model: OM120 / OS420
SN: M02100020/ S02100010

Power Supply: Battery powered (2X AA in each unit)

Internal Boards:

Description	Part Number	Serial #	Rev	Freq. in Mhz
OM120 Main Bd	MTB-1000	None	B	11.059, 32.768
OS420 Main Bd	SRC-1000	None	A	None

Application Software: OM120 - AFSMINI-102 Rev 102
OS420 - None
Oscillator Frequencies: 11.059Mhz, 32.768Mhz

Associated Equipment: None

Cables:

Quantity	Description	Shielded	Length
1	Fiber Optic	No	3 m

Modifications made to Equipment Required for Compliance: None

Performance Criteria:

A: Normal performance - EUT receiver constantly monitoring EUT transmitter

B: Temporary degradation - temporary blank screen or "-" (negative condition).

C: Temporary loss of function or performance which is recoverable - blank screen or "-" (negative condition) that can be cleared only by turning unit off and then back on.

D: Degradation or loss of function, which is not recoverable - blank screen or "-" (negative condition) that cannot be cleared.

3.0 TEST DESCRIPTION

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

Temperature:	21 degrees C
Relative Humidity:	20 %

The EUT was connected as diagrammed in Section 7.0 of this report. The customer was not present during testing.

A horizontal coupling plane (HCP) was placed on a non-conductive table, 0.8 meters above the ground plane. The EUT was placed on the table with an insulating support between the EUT and the HCP. All cables were also isolated from the HCP. See Section 9 for photographs of typical set-ups

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 which are normally accessible to the operator for normal operation or maintenance as specified by the customer. The EUT was subjected to Severity Level 2, plus/minus 4 Kv contact discharge and Level 3, plus/minus 8 Kv air discharge. Contact discharge is the preferred test method. Air discharges are used where contact discharge cannot be applied.

NOTES:

1. See Section 8, for typical ESD waveshape.

2. See Section 7, for ESD test locations.

Deviations: There were no deviations to the test procedure.

Mode of EUT Operation: Running in normal mode.

4.0 TEST RESULTS

The Advanced Fiber Solutions' Fiber Optic Cable Tester, OM120 / OS420 meet the requirements of EN50082-1 and EN55024 using the test methods described in EN61000-4-2 (1998).

ESD110502

5.0 TEST DATA

Customer: Advanced Fiber Solutions
Product: Fiber Optic Cable Tester
Model: OM120 / OS420

	Contact Discharge (Current Injection)								Air Discharge							
	Level 1		Level 2		Level 3		Level 4		Level1		Level 2		Level 3		Level 4	
Voltage	2KV		4KV		6KV		8KV		2KV		4KV		8KV		15 KV	
	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
1	A	A	A	A					A	A	A	A	A	A		
2	A	A	A	A					A	A	A	A	A	A		
3									A	A	A	A	A	A		
4									A	A	A	A	A	A		
5									A	A	A	A	A	A		
6									A	A	A	A	A	A		
7									A	A	A	A	A	A		
8									A	A	A	A	A	A		
9									A	A	A	A	A	A		
10									A	A	A	A	A	A		
11									A	A	A	A	A	A		
12									A	A	A	A	A	A		
13									A	A	A	A	A	A		
14									A	A	A	A	A	A		
15																
16																
17																
18																
19																
20																
21																
22																
23																
24																
25																
Indirect Application of discharge/coupling plane																
Horz.	A	A	A	A												
V.Front	A	A	A	A												
V.Left	A	A	A	A												
V.Right	A	A	A	A												
V.Rear	A	A	A	A												

Results Key:
Performance Criterion A: Normal performance within the specification limits without operator intervention
Performance Criterion B: Temporary degradation, or loss of function or performance, which is self-recovering.
Performance Criterion C: Temporary degradation, or loss of function or performance, which requires intervention or system reset to occur.
Performance Criterion D: Degradation or loss of function, which is not recoverable due to damage to equipment,components,software, or loss of data

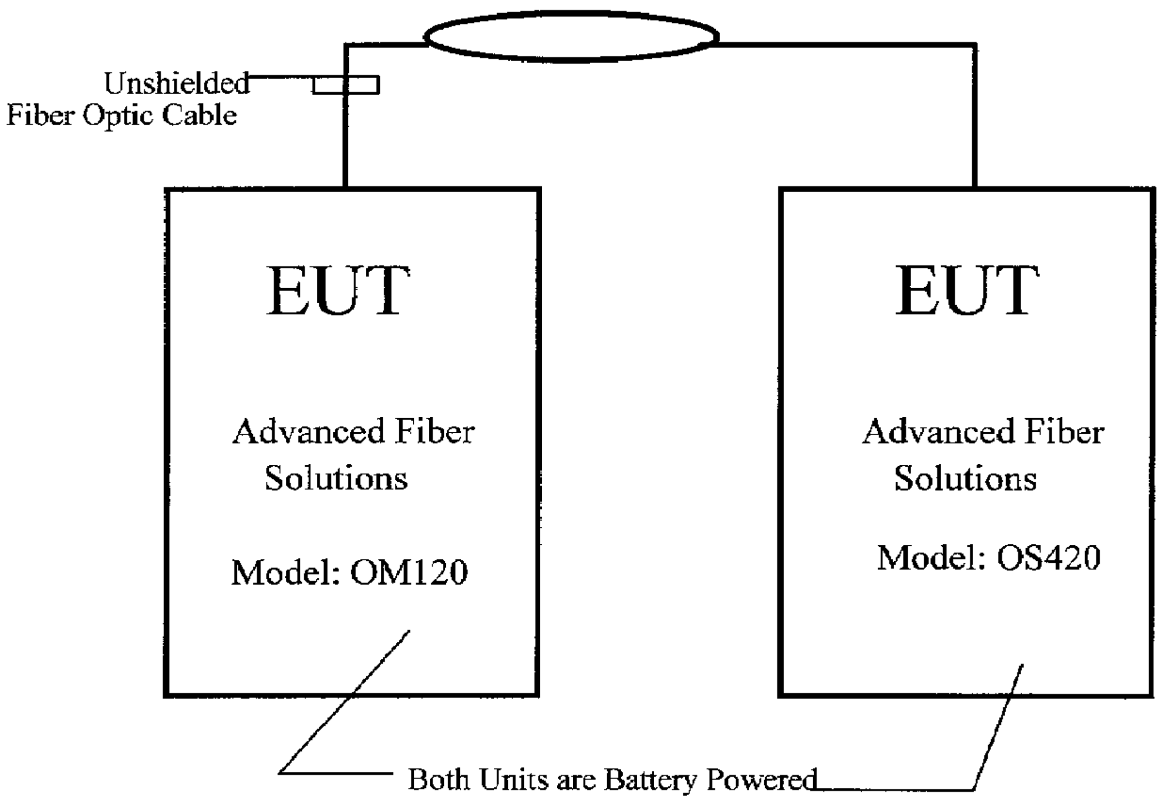
6.0 TEST EQUIPMENT

	Equipment	Serial #	Last Cal	Cal Due
	Keytek MZ-15/EC - True ESD Simulator	9511366	03/13/01	03/13/02
	Keytek MZ-15/EC - True ESD Simulator	9403287	05/08/01	05/08/02
	Keytek TPC-2-Omni-Tip	9707333	03/13/01	03/13/02
	Keytek TPC-2-Omni-Tip	9904174	05/08/01	05/08/02
	Keytek TPC-2-Omni-Tip	9904175	05/08/01	05/08/02
	Keytek TPC-2-Omni-Tip	9904176	05/08/01	05/08/02
	Haefely Trench PESD 1600 ESD Simulator	H706182	07/19/01	07/19/02
*	Coupling Plane ESD Plate	N/A	N/A	N/A
*	Schaffner NSG435 ESD Simulator	3179	09/20/02	09/20/03

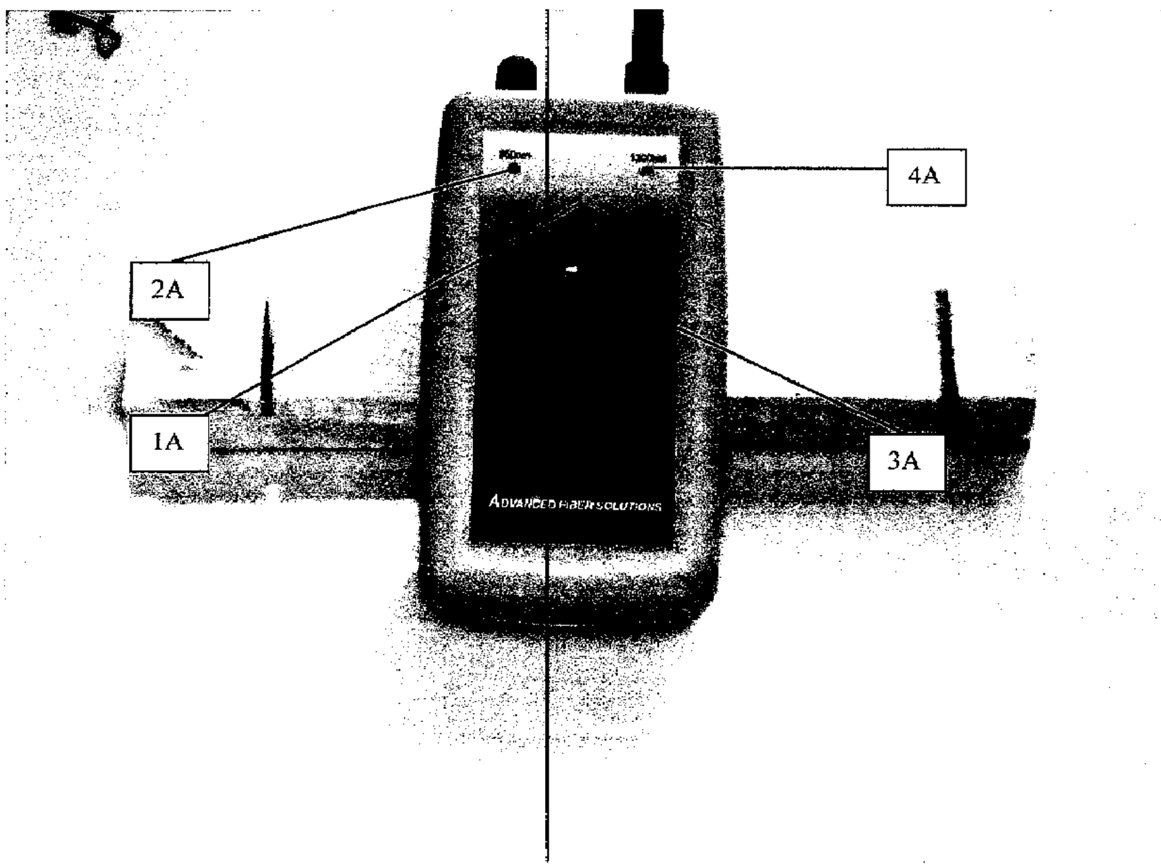
* Indicates equipment used for this testing

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

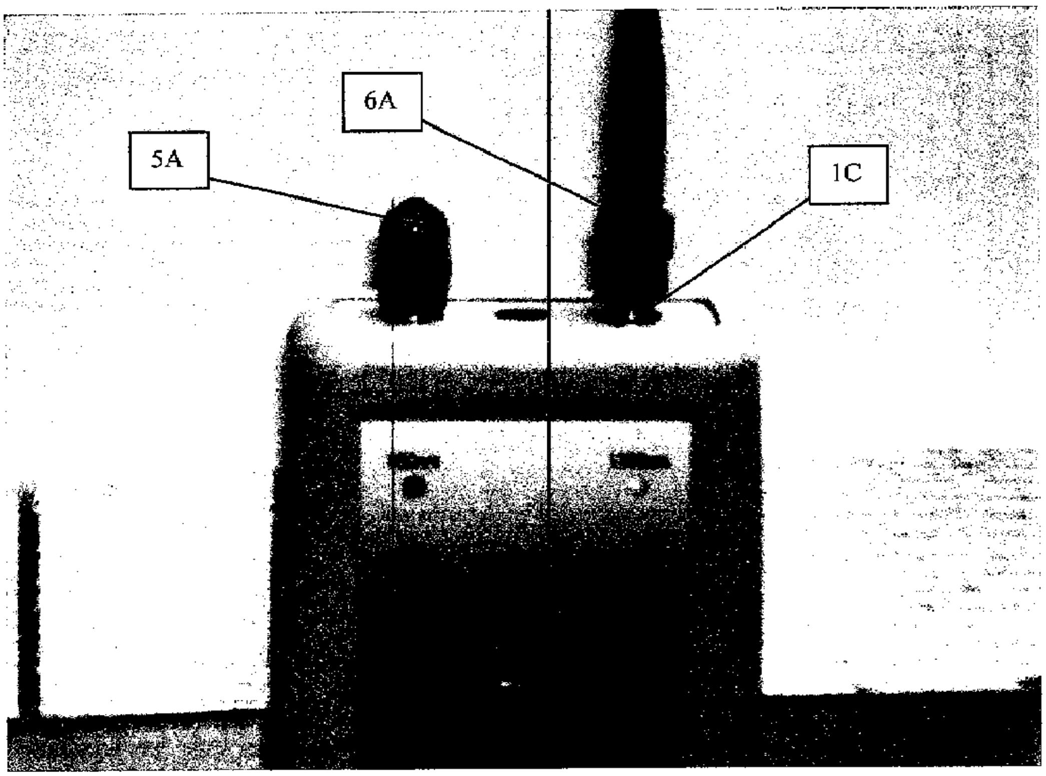
7.0 BLOCK DIAGRAM



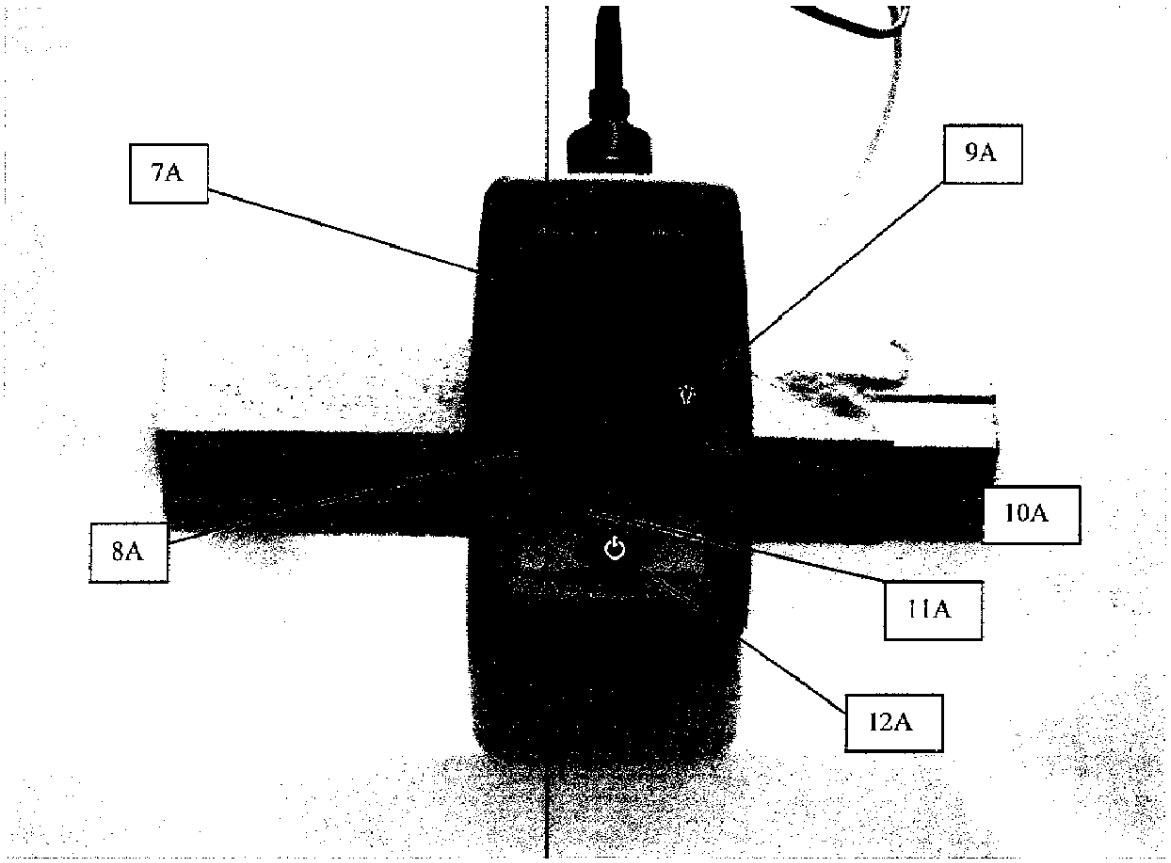
7.0 BLOCK DIAGRAMS, ESD TEST LOCATIONS



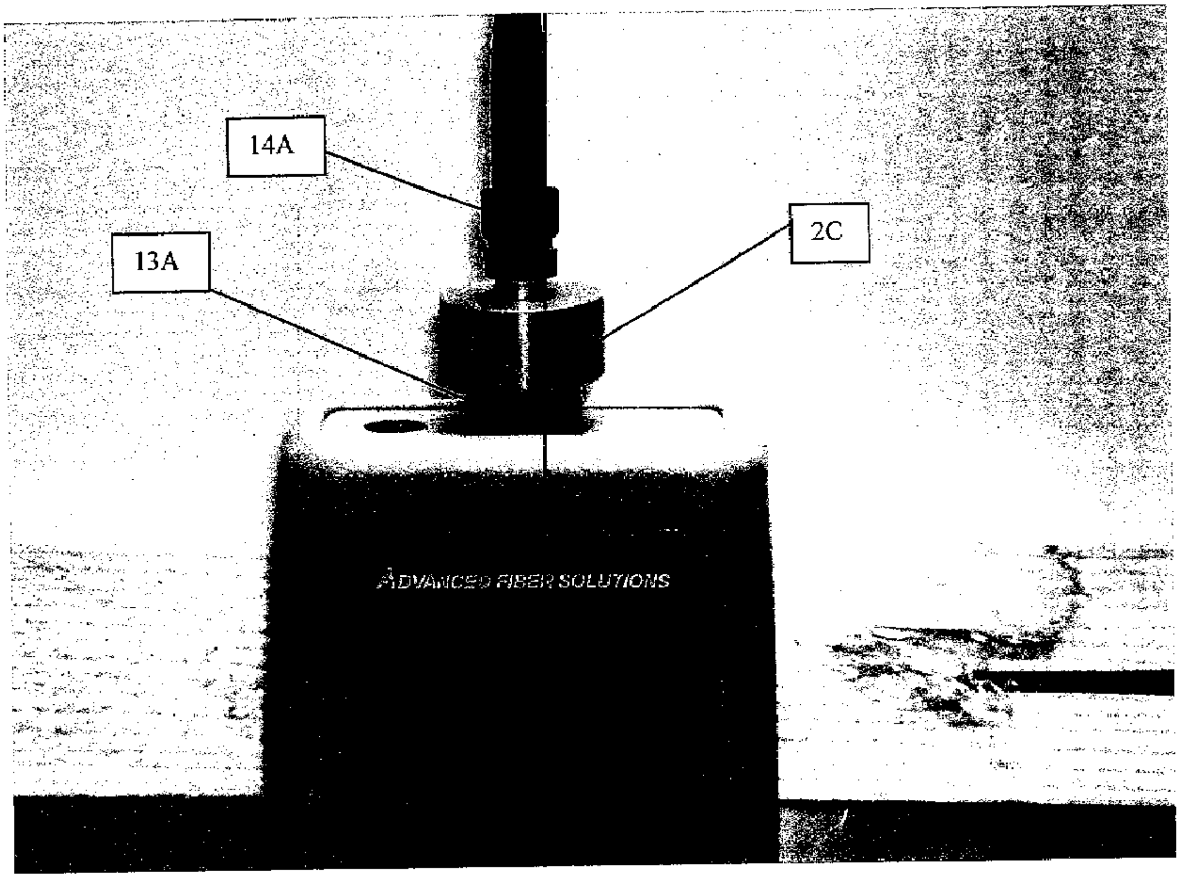
7.0 BLOCK DIAGRAMS, ESD TEST LOCATIONS



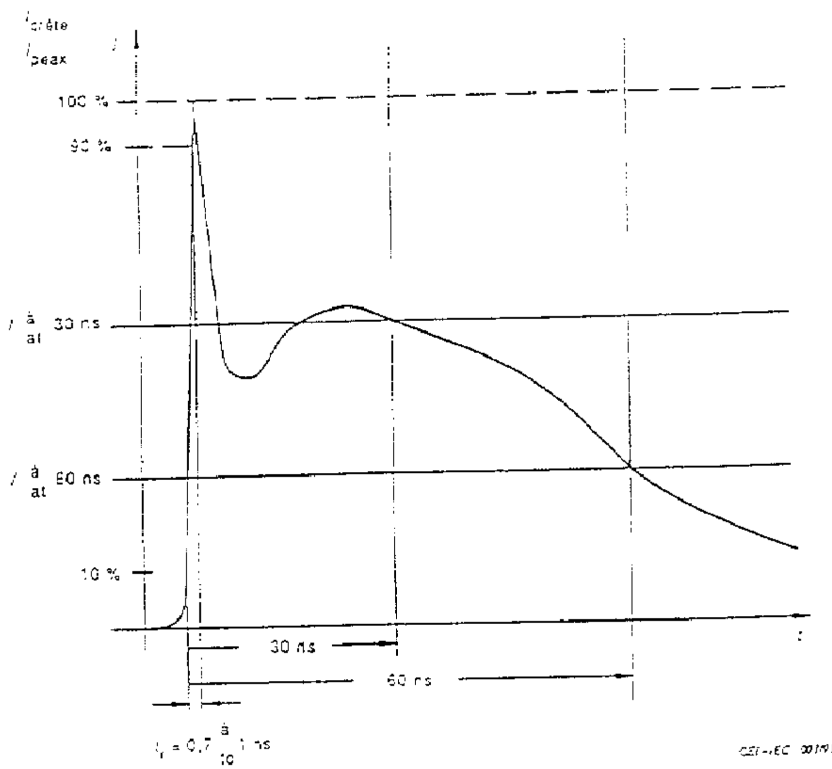
7.0 BLOCK DIAGRAMS, ESD TEST LOCATIONS



7.0 BLOCK DIAGRAMS, ESD TEST LOCATIONS



8.0 FIGURES

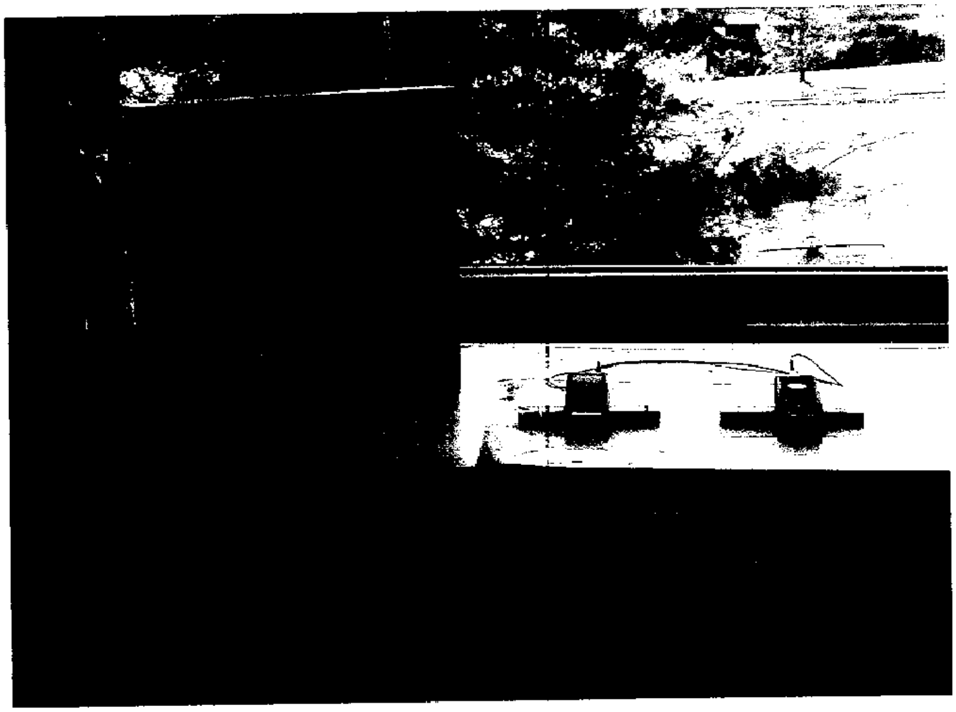


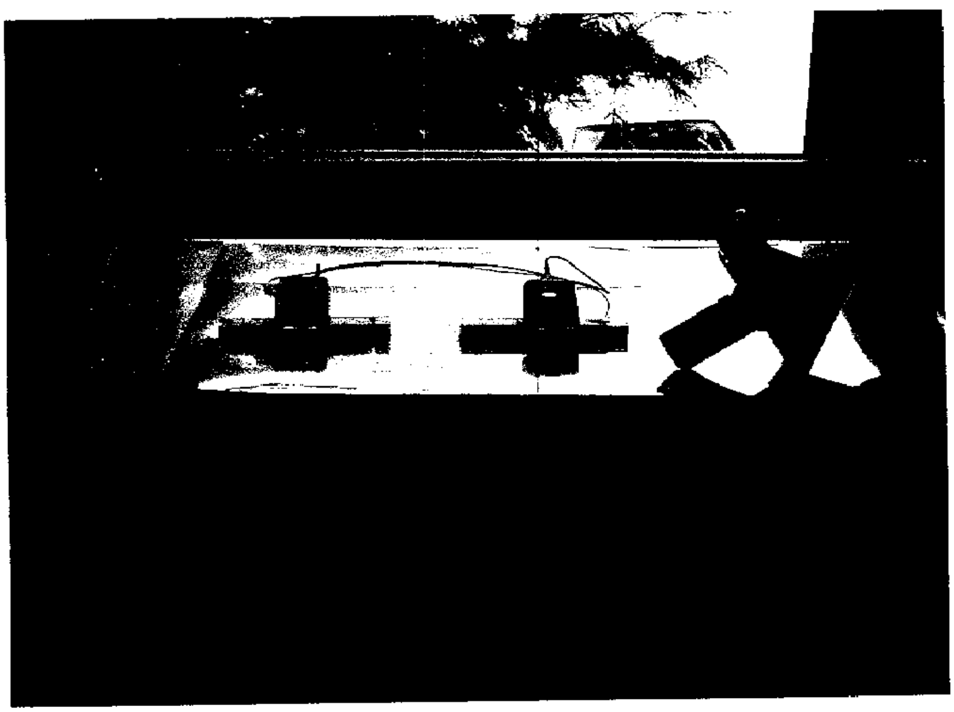
Les valeurs sont données dans le tableau 2.

Values are given in table 2.

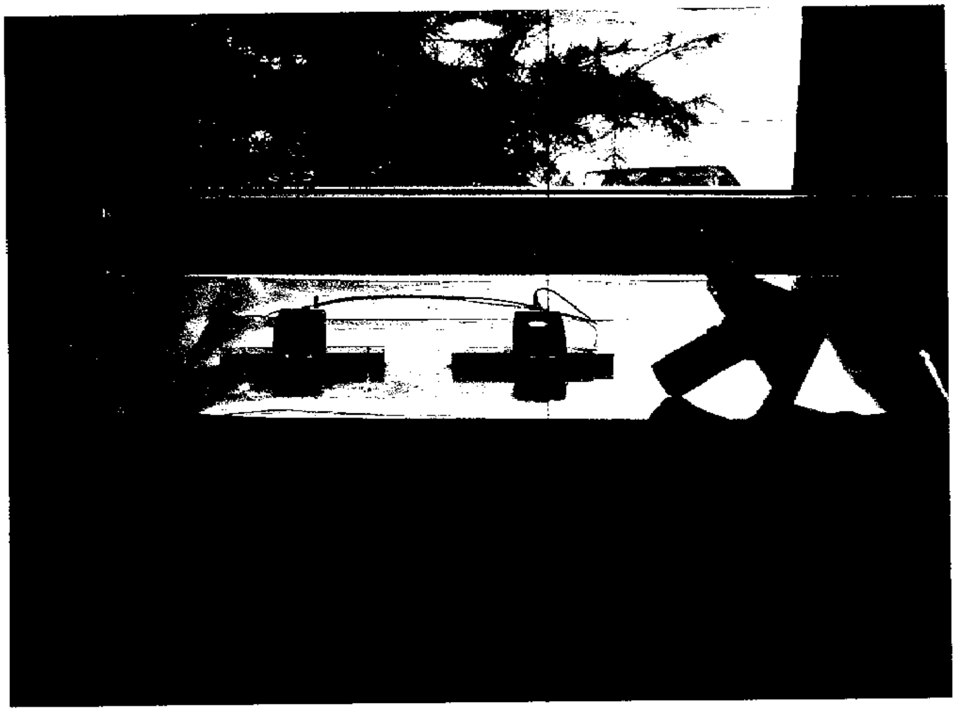
Figure 3 – Forme d'onde typique du courant de sortie du générateur de DES
Typical waveform of the output current of the ESD generator

9.0 PHOTOGRAPHS





9.0 PHOTOGRAPHS



Marlboro Test Labs integrated quality services

EN 61000-4-3 (1998) Electromagnetic Susceptibility TEST REPORT

Applicant:	Advanced Fiber Solutions 45 Franklin Street Milton, MA 02186
Equipment Under Test:	Fiber Optic Cable Tester OM120 / OS420
Test Location:	Marlboro Test Labs 55 Fairbanks Boulevard Marlboro, MA 01752-1298
Test Date:	October 23, 2002

Tested & Reviewed By: Bill Farrell

B. Farrell
Test Engineer

Reviewed By:

L. Brunk
Lab Manager

TABLE OF CONTENTS

1.0 OVERVIEW

This report has been compiled to document the RF Radiated Immunity test parameters, effects and results of the Advanced Fiber Solutions' Fiber Optic Cable Tester, OM120 / OS420, in comparison to the requirements for equipment, as specified in the following documents:

89/336/EEC (3 May 1989)	Official Journal of the European Communities Council Directive on Electromagnetic Compatibility
92/31/EEC (28 April 1992)	Official Journal of the European Communities Amending Directive 89/336/EEC on: Council Directive on Electromagnetic Compatibility
EN50082-1 (January 1997)	Electromagnetic Compatibility - Generic Immunity Standard Part 1: Residential, commercial and light industry (Requires ENV50204)
EN55024 (1998)	Information technology equipment – Immunity characteristics – Limits and methods of measurement
EN61000-4-3 (1998)	Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques - Section 3: Radiated, radio frequency, electromagnetic field immunity test

2.0 PRODUCT IDENTIFICATION

Equipment Under Test:

Type: Fiber Optic Cable Tester
Model: OM120 / OS420
SN: M02100020/ S02100010

Power Supply: Battery powered (2X AA in each unit)

Internal Boards:

Description	Part Number	Serial #	Rev	Freq. in Mhz
OM120 Main Bd	MTB-1000	None	B	11.059, 32.768
OS420 Main Bd	SRC-1000	None	A	None

Application Software: OM120 - AFSMINI-102 Rev 102
OS420 - None
Oscillator Frequencies: 11.059Mhz, 32.768Mhz

Associated Equipment: None

Cables:

Quantity	Description	Shielded	Length
1	Fiber Optic	No	1 m

Modifications made to Equipment Required for Compliance: None

Performance Criteria:

A: Normal performance - EUT receiver constantly monitoring EUT transmitter

B: Temporary degradation - temporary blank screen or "-" (negative condition).

C: Temporary loss of function or performance which is recoverable - blank screen or "-" (negative condition) that can be cleared only by turning unit off and then back on.

D: Degradation or loss of function, which is not recoverable - blank screen or "-" (negative condition) that cannot be cleared.

3.0 TEST DESCRIPTION

The EUT was connected as diagrammed in Section 7.0 of this report. All testing and verification for EUT operation was monitored utilizing the application software. The customer was not present during testing.

The EUT set up was placed in an RF ferrite tile shielded room in accordance with the EN61000-4-3 standard, with the following environmental conditions:

Temperature:	70 degrees F
Relative Humidity:	35 %

The EUT was placed on a non-conductive table, 0.8 meters above the ground plane. The I/O cable was placed on the non-conductive table. The RF Radiated immunity test was performed with the radiating source antenna directed toward each of the 4 orthogonal axis to the EUT. Testing was performed with the radiating antenna oriented both horizontally and vertically. The functionality of the EUT was then monitored. See Section 9 for photographs of typical EUT set-ups.

The Radiated Field test parameters for EN61000-4-3:

- Frequency range: 80 Mhz to 1.0 Ghz
- Field Strength: 3 v/m
- Modulation: 80% amplitude modulated 1 Khz sinewave
- Frequency sweep rate: not to exceed 1.5 x 0.001 decades per second

NOTE: See Section 8, Figure 1 for typical RF waveshapes.

Test Level(Severity Level): Severity Level 2 was applied for this particular product, the Advanced Fiber Solutions' Fiber Optic Cable Tester, OM120 / OS420, which means the field strength is set to 3 v/m for EN61000-4-3.

Deviations: There were no deviations to the test procedure.
Mode of EUT Operation: Running in normal mode.

4.0 TEST RESULTS

The Advanced Fiber Solutions' Fiber Optic Cable Tester, OM120 / OS420 meets the requirements of EN50082-1 and EN55024 using the test methods described in EN 61000-4-3 (1998).

5.0 TEST DATA

The following testing was performed on all 4 sides of the EUT, the Advanced Fiber Solutions' Fiber Optic Cable Tester, OM120 / OS420

Parameters:

Severity Level:	2 (3 Volts/meter & 80% AM Modulation @ 1 KHz)
Frequency Steps:	1 % increments of previous frequency 80-1000 MHz - 15 KHz
Dwell Time:	2s
Amplitude:	100mv

Results:

Biconilog 80-1000 MHz

Orientation	Mhz Frequency	Field	Modulation	Observed Effect
Vertical	80-1000	3 v/m	1KHz, 80%	No change in performance
Horizontal	80-1000	3 v/m	1KHz, 80%	No change in performance

	Horizontal	Vertical		Horizontal	Vertical
Front	A	A	Left	A	A
Back	A	A	Right	A	A

Results Key:
Performance Criterion A: Normal performance within the specification limits without operator intervention
Performance Criterion B: Temporary degradation, or loss of function or performance, which is self-recovering.
Performance Criterion C: Temporary degradation, or loss of function or performance, which requires intervention or system reset to occur.
Performance Criterion D: Degradation or loss of function, which is not recoverable due to damage to equipment,components,software, or loss of data

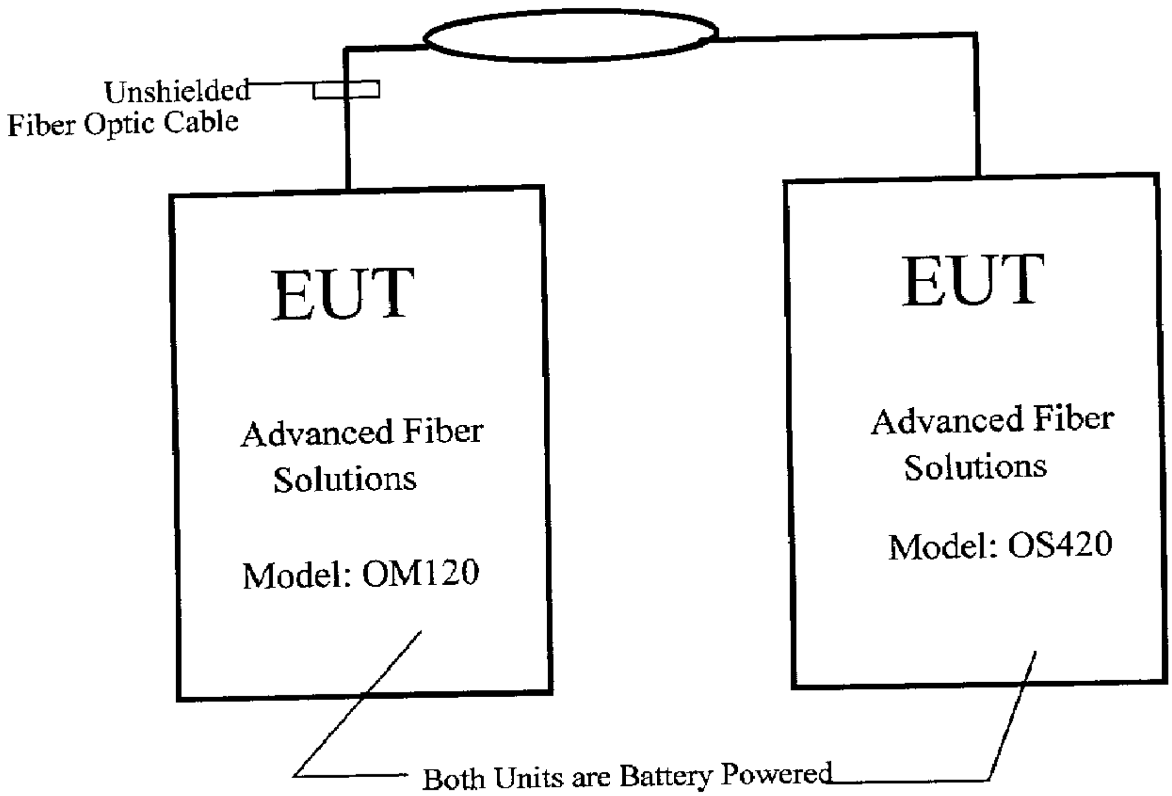
6.0 TEST EQUIPMENT for EN 61000-4-3 (1998)

	Equipment	Serial #	Last Cal	Cal Due
*	Rayproof Ferrite Tile Anechoic Chamber	SL11590	10/01/02	10/01/03
*	EMCO - Biconical Antenna Model 3109	9304-2715	06/04/02	06/04/03
*	EMCO - Log Periodic Antenna Model 3146	9203-3362	06/17/02	06/17/03
*	IFI Amplfier Model 5580-20	0593-4281	09/12/02	09/12/03
*	HP - Signal Generator Model 8642A	2531A00258	09/12/02	09/12/03
*	HP Power Meter HP437B	3125U17088	09/12/02	09/12/03
*	HP Power Sensor HP 8482H	3318A06777	09/12/02	09/12/03
*	Werlatone High Power Coupler C2630	2210	09/12/02	09/12/03
*	EMCO - Chase RF Immunity Software Ver.4.31	None	N/A	N/A

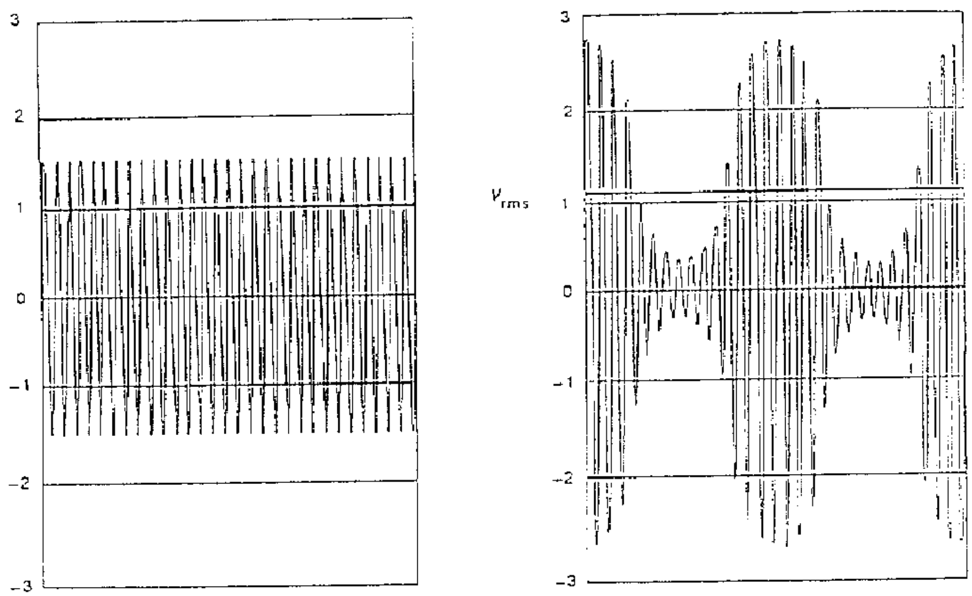
* Indicates equipment used for this testing

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

7.0 BLOCK DIAGRAM



8.0 FIGURES

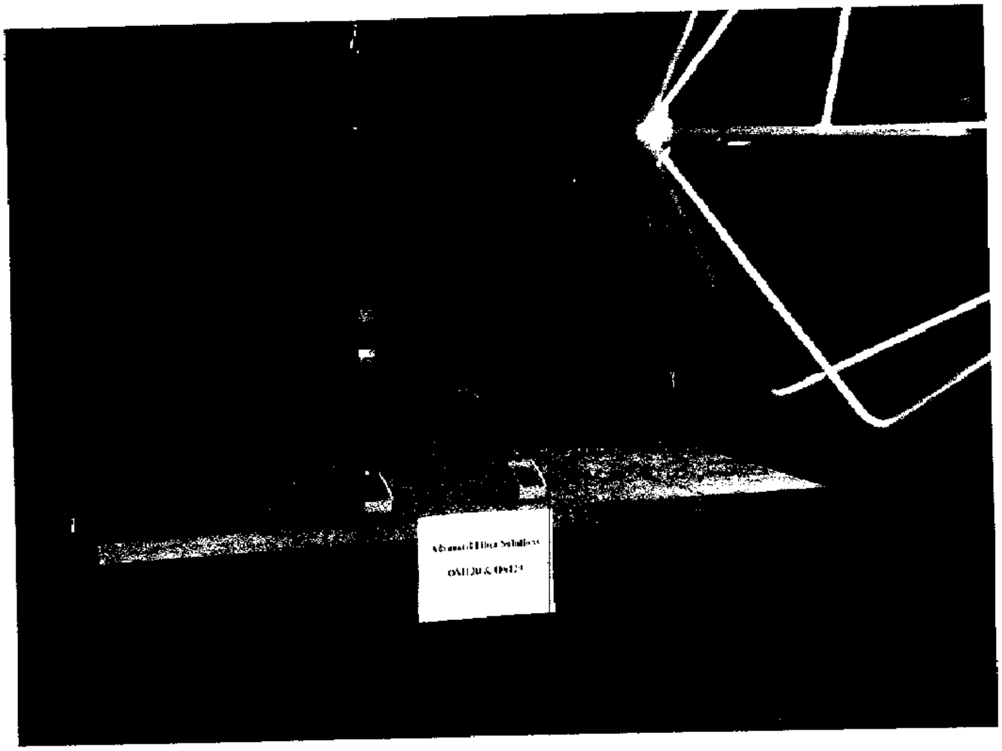


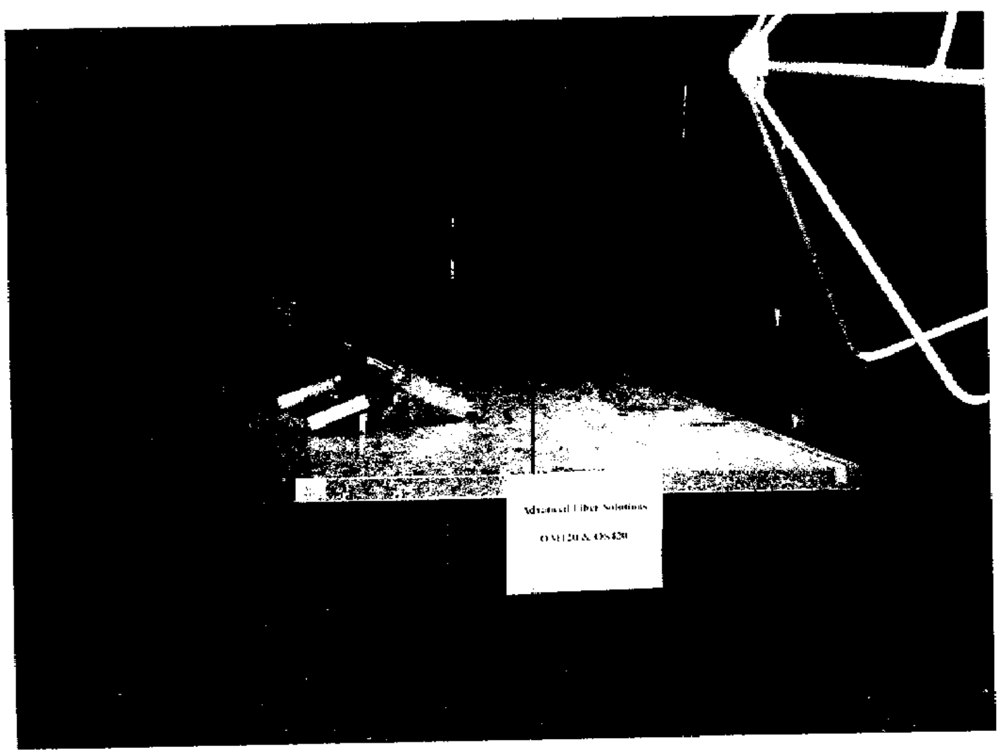
a) Unmodulated RF-signal
$V_{p\text{-}p}$ = 2,8 V
V_{rms} = 1,0 V

b) Modulated RF-signal 80 % AM
$V_{p\text{-}p}$ = 5,1 V
V_{rms} = 1,12 V

Figure 1 – Definition of the test level and the waveshapes occurring at the output of the signal generator (test level 1)

9.0 PHOTOGRAPHS





9.0 PHOTOGRAPHS