

*FCC PART 15, SUBPART B & C
TEST REPORT*

for

AUTOMOTIVE IMMOBILIZER
Model: AI100DA
FCC ID: ODJAI100DA

Prepared for

TELECTRA INTERNATIONAL, INC.
771 HALEVY STREET
VENTURA, CA 93003

COMPATIBLE ELECTRONICS INC.
2337 TROUTDALE DRIVE
AGOURA, CALIFORNIA 91301
(818) 597-0600

DATE: JANUARY 13, 1999

	REPORT BODY	APPENDICES				TOTAL
		<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	
PAGES	18	2	2	6	7	35

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LIST OF APPENDICES

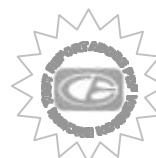
APPENDIX	TITLE
A	Modifications to the EUT
B	Additional Models Covered Under This Report
C	Diagrams, Charts and Photos <ul style="list-style-type: none"> • Test Setup Diagrams • Antenna and Effective Gain Factors • Radiated Emissions Photos
D	Data Sheets

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TABLE	TITLE
1	Radiated Emissions Test Results

LIST OF FIGURES

FIGURE	Title
1	Plot Map And Layout of Test Site



GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Compatible Electronics Inc., which is an independent testing and consulting firm. The test report is based on testing performed by Compatible Electronics personnel according to the measurement procedures described in the test specifications given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced in any form unless done so in full with the written permission of Compatible Electronics.

This report must not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government.

Device Tested: Automotive Immobilizer
Model: AI100DA
S/N: none

Product Description: *This is a vehicle theft prevention system used for automobiles.*

Modifications: The EUT was not modified during the testing.

Manufacturer: Telectra International, Inc.
771 Halevy Street
Ventura, CA 93003

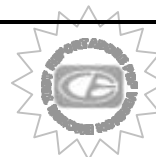
Test Date: January 8, 1999

Test Specifications:
EMI requirements
FCC Title 47, Part 15 Subpart B & C
Test Procedure: ANSI C63.4: 1992.

Test Deviations: The test procedure was not deviated from during the testing.

SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	RESULTS
1	Conducted RF Emissions, 450 kHz - 30 MHz.	This device is battery operated and does not draw power from public mains hence no conducted test was required.
2	Radiated RF Emissions, 30 MHz – 1000 GHz.	Complies with the Class B limits of FCC Title 47, Part 15 Subpart B.
3	Radiated RF Emissions, 134kHz to 1.340MHz.	Complies with the limits of FCC Title 47, Part 15 Subpart C.



1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the Automotive Immobilizer Model: AI100DA. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4: 1992. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT hereafter, are within the specification limits defined in FCC Title 47, Part 15, Subpart C, 15.109 and 15.209.



2. ADMINISTRATIVE DATA

2.1 Location of Testing

The EMI tests described herein were performed at the test facility of Compatible Electronics, 2337 Troutdale Drive, Agoura, California 91301.

2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The calibration is traceable to the National Institute of Standards and Technology (NIST).

2.3 Cognizant Personnel

Telectra International, Inc.

Chander Oberoi

President & CEO

Compatible Electronics, Inc.

Joey J. Madlangbayan

Test Technician

Jeff S. Klinger

Lab Manager

2.4 Date Test Sample was Received

The test sample was received on January 8, 1999.

2.5 Disposition of the Test Sample

The test sample remains at Compatible Electronics.

2.6 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document.

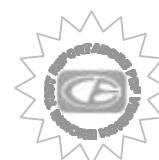
RF	Radio Frequency
EMI	Electromagnetic Interference
EUT	Equipment Under Test
P/N	Part Number
S/N	Serial Number
HP	Hewlett Packard
ITE	Information Technology Equipment
CML	Corrected Meter Limit
LISN	Line Impedance Stabilization Network



3. APPLICABLE DOCUMENTS

The following documents are referenced or used in the preparation of this EMI Test Report.

SPEC	TITLE
FCC Title 47, Subpart C.	FCC Rules - Intentional Radiators.
FCC Title 47, Subpart B.	FCC Rules – Radio frequency devices (including digital devices).
CISPR 16 1993	Specification for radio disturbance and immunity measuring apparatus and methods.
ANSI C63.4 1992	Methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz.



4. DESCRIPTION OF TEST CONFIGURATION

4.1 Description of Test Configuration - EMI

The EUT was set up in a tabletop configuration. The EUT antenna and transmit lines were connected to the EUT. A 12VDC battery was connected to the EUT to power the unit. The EUT was tested while continuously transmitting a signal waiting for the transponder to activate and retransmit the signal back to the EUT.

It was determined that the highest emission levels were found in the above configuration. The final radiated data was taken in this mode of operation. All initial investigations were performed with the EMI Receiver in manual mode scanning the frequency range continuously. Photographs and data sheets are included in Appendices C and D (respectively).



4.1.1 Cable Construction and Termination

Cable 1 This is a 1 meter unshielded round 3 wire spiral cable connected to the LED out port of the EUT. It has a 3 pin keyed connector at the EUT end and an LED connected to the other end.

Cable 2 This is 1 meter unshielded round 2 wire spiral cables connected to the transmit and receive port of the EUT. It has a 2 pin keyed connector at the EUT end and a small loop antenna hard wired at the opposite end.

12 Wire Main Harness

This is ½ meter unshielded round 12 wire harness which connects to the EUT and to the vehicle's electrical system. It has a 12 pin keyed connector at the EUT end and all pins were left unterminated except pins 3, 4, & 5 which were connected to a 12VDC battery source.



5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT**5.1 EUT and Accessory List**

EQUIPMENT TYPE	MANUFACTURER	MODEL	SERIAL NUMBER
AUTOMOTIVE IMMOBILIZER	TELECTRA INTERNATIONAL, INC	AI100DA	S/N: NONE FCC ID: ODJAI100DA



5.2 EMI Test Equipment

EQUIPMENT TYPE	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
EMI Receiver	Hewlett Packard	8546A	3325A00140	Mar. 08, 1998	Mar. 08, 1999
Preamplifier	Com Power	PA-102	01249	Apr. 20, 1998	Apr. 20, 1999
Biconical Antenna	Com Power	AB-100	01535	Apr. 17, 1998	Apr. 17, 1999
Log Periodic Antenna	Com Power	AL-100	A101	Apr. 16, 1998	Apr. 16, 1999
Active Loop Antenna	Com Power	AL-130	25309	Feb. 5, 1998	Feb. 5, 1999
Antenna Mast	Com Power	AM-400	N/A	N/A	N/A
Turntable	Com Power	TT-106A	N/A	N/A	N/A



6. TEST SITE DESCRIPTION

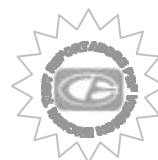
6.1 Test Facility Description

Please refer to section 2.1 and 7.1.2 of this report for EMI test location.

6.2 EUT Mounting, Bonding and Grounding

The EUT was mounted on a 1.0 by 1.5 meter non-conductive table 0.8 meters above the ground plane.

The EUT was not grounded.



7. TEST PROCEDURES

The following sections describe the test methods and the specifications for the tests. Test results are also included in this section.

7.1 RF Emissions

7.1.1 Conducted Emissions Test

The EMI Receiver was used as a measuring meter. The data was collected with the EMI Receiver in the peak detect mode with the "Max Hold" feature activated. The quasi-peak was used only where indicated in the data sheets. A 10 dB attenuation pad was used for the protection of the spectrum analyzer input stage, and the EMI Receiver offset was adjusted accordingly to read the actual data measured. The LISN output was read by the EMI Receiver. The output of the second LISN was terminated by a 50 ohm termination. The effective measurement bandwidth used for the conducted emissions test was 9 kHz.

Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The EUT was powered through the LISN, which was bonded to the ground plane. The LISN power was filtered and the filter was bonded to the ground plane. The EUT was set up with the minimum distances from any conductive surfaces as specified in ANSI C63.4: 1992. The excess power cord was wrapped in a figure eight pattern to form a bundle not exceeding 0.4 meters in length.

The initial test data was taken in manual mode while scanning the frequency ranges of 0.15 MHz to 1.6 MHz, 1.6 MHz to 5 MHz and 5 MHz to 30 MHz. The conducted emissions from the EUT were maximized for operating mode as well as cable and peripheral placement. Once a predominant frequency (within 12 dB of the limit) was found, it was more closely examined with the EMI Receiver span adjusted to 1 MHz.

The EUT is a battery powered device which does not connect to the public mains, therefore no conducted test was required.



7.1.2 Radiated Emissions Test

The EMI Receiver was used as a measuring meter. The Preamplifier was used to increase the sensitivity of the instrument. The EMI Receiver was used in the peak detect mode with the "Max Hold" feature activated. In this mode, the receiver records the highest measured reading over all the sweeps. The quasi-peak was used only for those readings which are marked accordingly on the data sheets. The effective measurement bandwidth used for the radiated emissions test was 120 kHz for readings under 1GHz and 1MHz for readings over 1GHz.

Broadband antennas were used as transducers during the measurement. The Loop antenna was used from 134.0kHz to 1.340MHz, the biconical antenna was used from 30MHz to 300MHz, the Log Periodic antenna was used from 300MHz to 1GHz. The frequency spans were wide (134KHz to 1.340MHz, 30 to 300, 300 to 1 GHz, during preliminary investigations. The final data was taken with a frequency span of 1 MHz. Furthermore, the frequency span was reduced during the preliminary investigations as deemed necessary.

The open field test site of Compatible Electronics, Inc. was used for radiated emission testing. This test site is set up according to ANSI C63.4: 1992. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters (for E field radiated field strength).

Preliminary testing was done at a distance of 1 meter instead of 3 meters to determine the predominant harmonics and spurious emission frequencies. An open field test site was used for the preliminary investigations. If and when any frequency was found to be above 30 microvolts/meter level (at 1 meter distance), this frequency was recorded as a significant frequency. All significant frequencies are further examined carefully at a reduced frequency span on the spectrum analyzer while changing the antenna height and EUT orientation. The bandwidth of the spectrum analyzer was varied to ensure that pulse desensitization did not occur.

The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the ambient signal does not hide any emissions from the EUT. The test results are listed in table 1.



7.1.3 RF Emissions Test Results

Table 1.0 RADIATED EMISSION RESULTS-
AUTOMOTIVE IMMOBILIZER Model: AI100DA

Frequency MHz	Meter* Reading dBuV/m	Effective Gain ** dB	Antenna Factor ** dB/m	Distance Factor dB	Corrected Reading dBuV/m	Spec. Limit dBuV/m	Delta dB
68.71	62.3#	35.3	10.5	0	37.5	40.0	-2.5
171.79	54.5	34.6	15.0	0	34.9	43.5	-8.6
192.32	40.3	34.5	15.7	0	21.5	43.5	-22.0
206.16	58.2#	34.4	16.4	0	40.2	43.5	-3.3
240.52	37.9	34.1	18.2	0	22.0	46.0	-24.0
294.89	38.9	33.7	19.4	0	24.6	46.0	-21.4

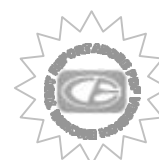
Notes:

* The complete emissions data is given in Appendix D of this report.

** The effective factor includes the cable loss. The correction factors for the antenna and effective gain are attached in [Appendix C](#) of this report.

Quasi-Peak Readings

R Restricted Band



7.1.4 RF Emissions Test Results (continued)

Table 2.0 **RADIATED EMISSIONS - SPURIOUS
AUTOMOTIVE IMMOBOLIZER**

The following bands were specifically scanned.

Frequency Band in MHz	RF Energy From Automotive Immobilizer at 3 meters (uV/m)
0.490 to 0.510	< 100
37.5 to 38.25	< 100
73 to 74.6	< 100
74.8 to 75.2	< 100
108 to 121.94	< 150
123 to 138	< 150
149.9 to 150.05	< 150
156.7 to 156.9	< 150
162.0125 to 167.17	< 150
167.72 to 173.2	< 150
240 to 285	< 200
322 to 335.4	< 200
399.9 to 410	< 200
608 to 614	< 200
960 to 1000	< 500



7.1.5 Sample Calculations

The Preamplifier was used to increase the sensitivity of the EMI Receiver. A correction factor for the antenna, preamplifier, cable loss and a distance factor (if any), must be applied to the meter reading before a true field strength reading can be obtained. For greater efficiency and convenience, instead of using these correction factors for each meter reading, the specification limit was modified to reflect these correction factors at each frequency, so that the meter readings can be compared directly to the modified specification limit, referred to henceforth as the corrected meter reading limit (CML).

The equation can be derived in the following manner:

$$\text{Corrected Meter Reading} = \text{meter reading} + F - G$$

where: F = antenna factor
G = effective gain (amplifier gain - cable loss)

Therefore, the equation for determining the corrected meter reading limit is:

$$\text{CML} = \text{spec. limit} - F + G$$

A table of corrected meter reading limits was used to permit immediate comparison of the meter reading and determine if the emission level exceeded the specification limit at that frequency. The correction factors for the antenna and the effective gain are attached in Appendix C of this report. The data sheets are attached in Appendix D.

The distance factor D is 0 when the test is performed at a distance of 3 meters.



8. CONCLUSIONS

The Automotive Immobiliser Model: AI100DA meets all of the requirements of the FCC Title 47, Part 15, Subpart B & C.





MODIFICATIONS TO THE EUT



MODIFICATIONS TO THE EUT

There were no modifications made to the EUT during the test.





APPENDIX B

***ADDITIONAL MODELS COVERED
UNDER THIS REPORT***



ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST

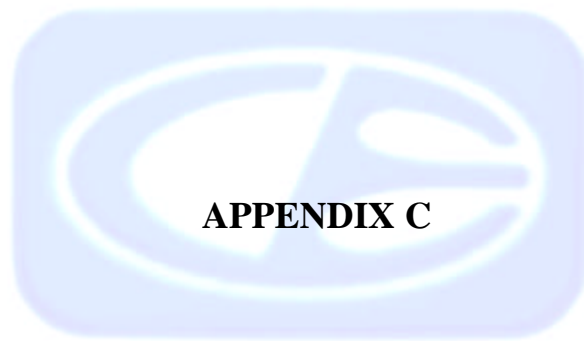
AUTOMOTIVE IMMOBILIZER

Model: AI100DA

S/N: none

There were no additional models covered under this report.

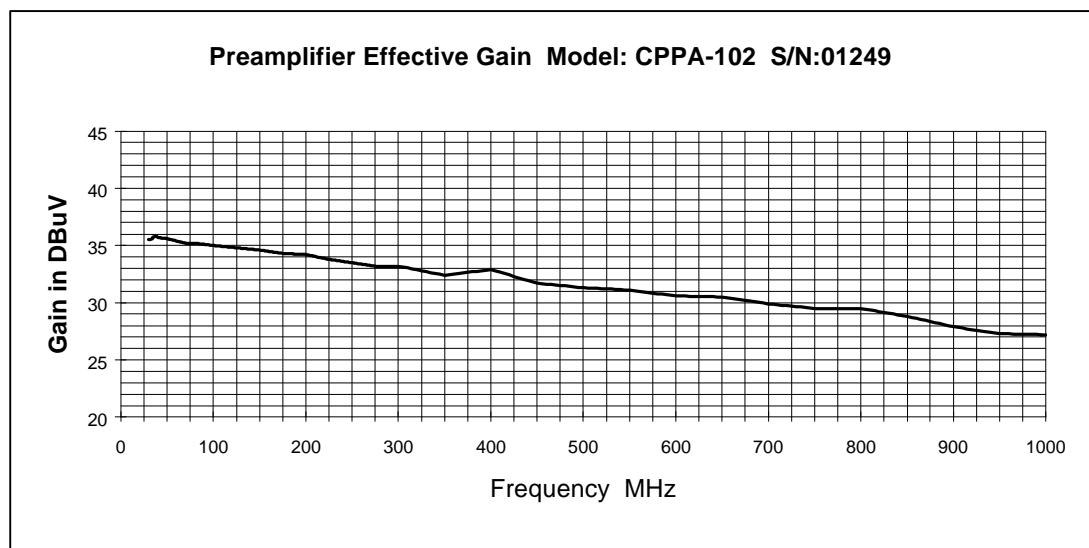
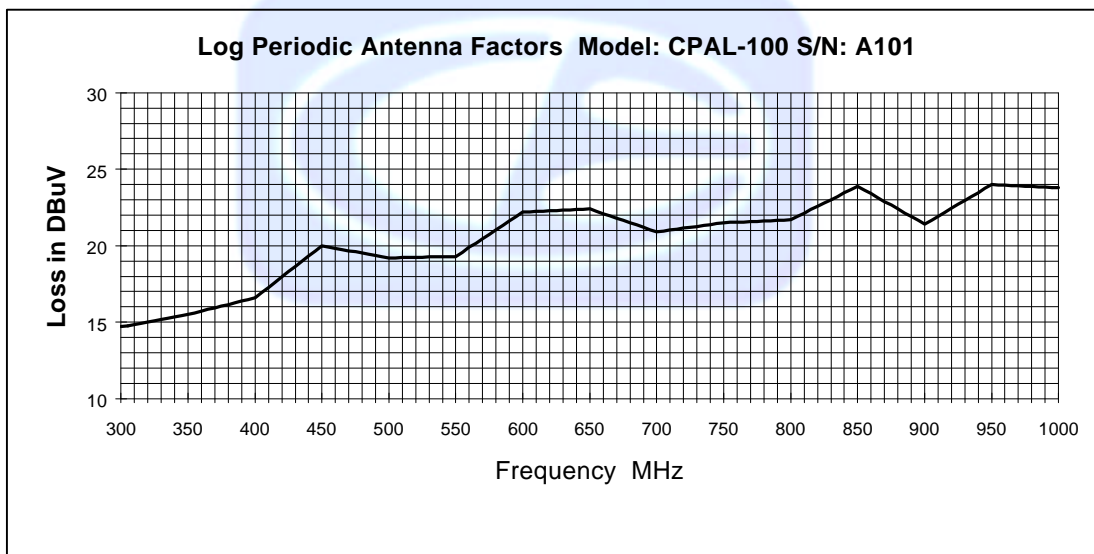
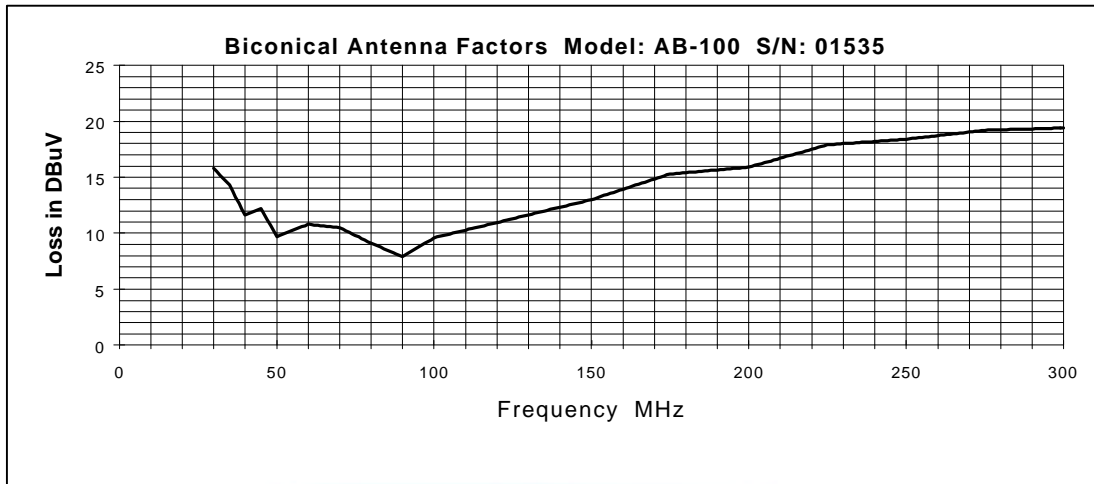




APPENDIX C

DIAGRAMS, CHARTS AND PHOTOS



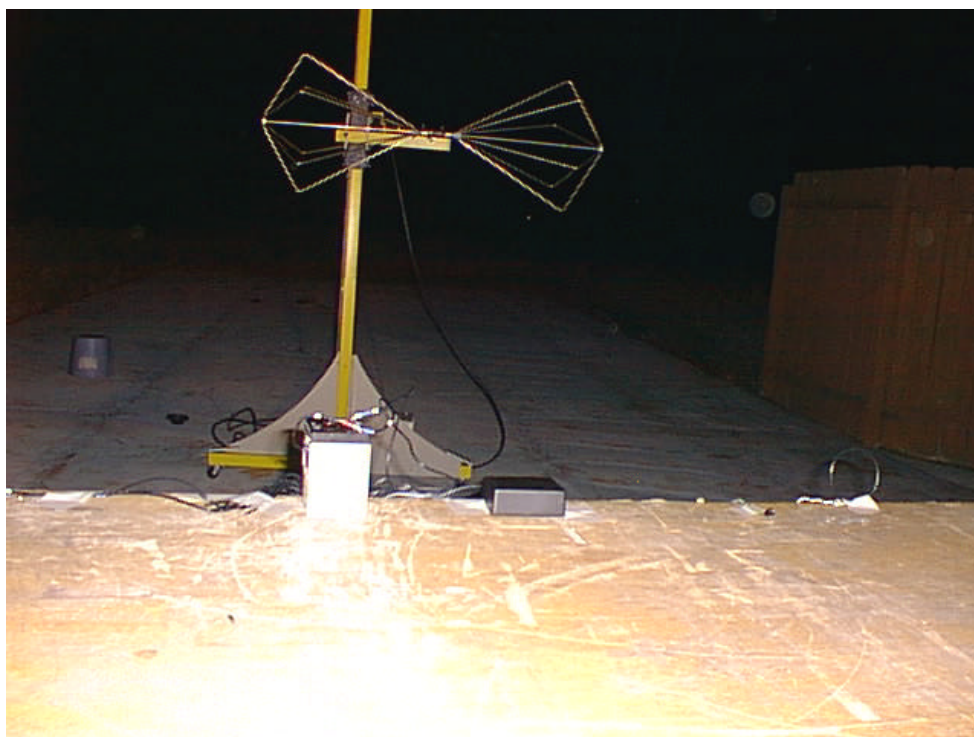


Com-Power Corporation

(714) 587-9800

Antenna Calibration		
Antenna Type: Loop Antenna	Transmit Antenna Height: 2 meters	
Model: AL-130	Receive Antenna Height: 2 meters	
Serial Number: 25309		
Calibration Date: 2-5/98		
Frequency MHz	Magnetic (dB/m)	Electric (dB/m)
0.01	-40.5	11.0
0.02	-41.6	9.9
0.03	-40.0	11.5
0.04	-40.3	11.2
0.05	-41.6	9.9
0.06	-41.1	10.4
0.07	-41.3	10.2
0.08	-41.6	9.9
0.09	-41.7	9.8
0.1	-41.8	9.7
0.2	-44.0	7.5
0.3	-41.6	9.9
0.4	-41.7	9.8
0.5	-41.7	9.8
0.6	-41.5	10.0
0.7	-41.5	10.0
0.8	-41.6	9.9
0.9	-41.6	9.9
1	-41.1	10.4
2	-40.7	10.8
3	-40.7	10.8
4	-40.9	10.6
5	-40.1	11.4
6	-40.0	11.5
7	-40.3	11.2
8	-39.8	11.7
9	-38.8	12.7
10	-40.8	10.7
12	-41.4	10.1
14	-41.4	10.1
15	-40.9	10.6
16	-40.8	10.7
18	-41.5	10.0
20	-41.5	10.0
25	-41.2	10.3
30	-41.4	10.1





FRONT SIDE

TELECTRA INTERNATIONAL, INC.

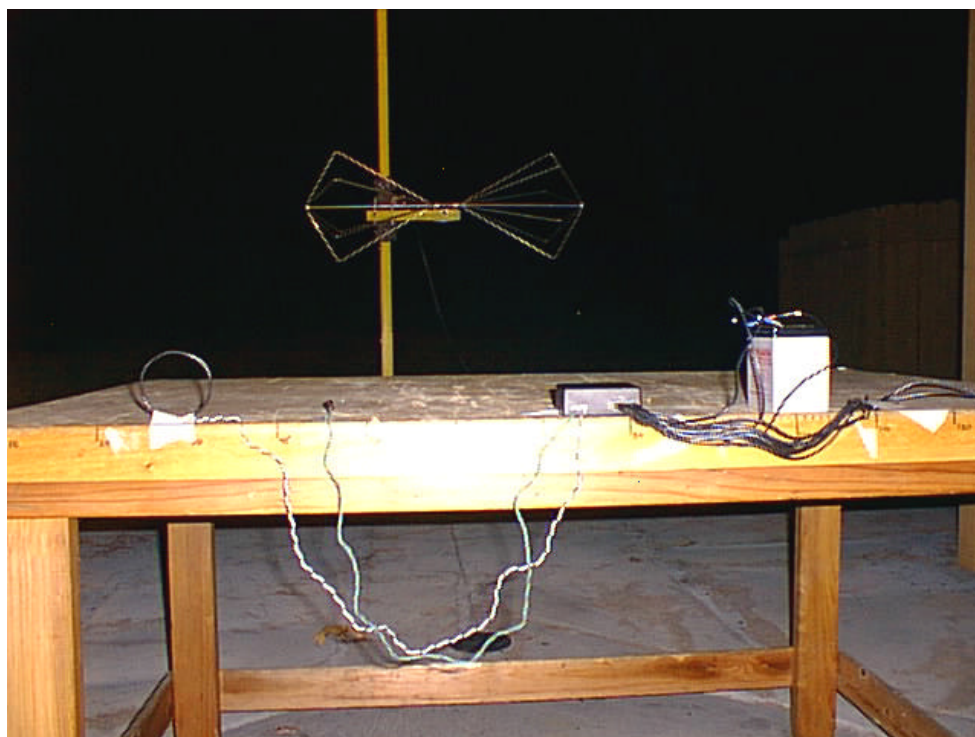
AUTOMOBILE IMMOBILIZER

Model: AI100DA

FCC PART 15 SUBPART B & C - RADIATED EMISSIONS – 1-9-9

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**





BACK SIDE

TELECTRA INTERNATIONAL, INC.

AUTOMOBILE IMMOBILIZER

Model: AI100DA

FCC PART 15 SUBPART B & C - RADIATED EMISSIONS – 1-8-99

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION
FOR MAXIMUM EMISSIONS**



APPENDIX D



**RADIATED EMISSIONS**COMPANY NAME: TELECTRA INT., INC. DATE: 1-8-99EUT: AUTOMOTIVE IMMOBILISER EUT S/N: NONEEUT MODEL: A1 100 DA LOCATION: ☐ BREA ☐ SILVERADO ☒ AGOURASPECIFICATION: FCC PT 15 CLASS: B TEST DISTANCE: 3M LAB: FANTENNA: ☐ LOOP ☒ BICONICAL ☒ LOG ☐ HORN POLARIZATION: ☒ VERT ☐ HORIZ☒ QUALIFICATION ☐ ENGINEERING ☐ MFG. AUDIT ENGINEER: J MAOLANGBAYAN

NOTES:

Humidity: 15%
Temp: 64°F

Frequency (MHz)	Peak Reading (dBuV/m)	Quasi- Peak (dBuV/m)	Antenna Height (meters)	Azimuth (degrees)	Delta * (dB)	Corrected Limit (dBuV/m)	Comments
206.16	51.3		1.0	180°	-10.2	61.5	
171.80	50.8		1.0	180°	-12.3	63.1	
68.71	59.0		1.0	180°	-5.8	64.8	BB 60-80
192.32	40.3		1.0	180°	-22.0	62.3	
294.89	38.9		2.0	180°	-21.4	60.3	
NO FREQUENCIES FOUND ABOVE 300MHZ							

* DELTA = METER READING - CORRECTED LIMIT



RADIATED EMISSIONS

COMPANY NAME: TELECTRA INT., INC. DATE: 1-8-99

EUT: AUTOMOTIVE IMMOBILIZER EUT S/N: NONE

EUT MODEL: AL100DA LOCATION: ☐ BREA ☐ SILVERADO ☒ AGOURA

SPECIFICATION: FCC CLASS: B TEST DISTANCE: 3m LAB: F

ANTENNA: ☐ LOOP ☒ BICONICAL ☒ LOG ☐ HORN POLARIZATION: ☐ VERT ☒ HORIZ

☒ QUALIFICATION ☐ ENGINEERING ☐ MFG. AUDIT ENGINEER: J. MADRANGBAYAN

NOTES:

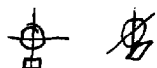
Humidity: 15%
Temp: 64°F

Frequency (MHz)	Peak Reading (dBuV/m)	Quasi- Peak (dBuV/m)	Antenna Height (meters)	Azimuth (degrees)	Delta * (dB)	Corrected Limit (dBuV/m)	Comments
68.71	63.7	62.3	4.0	180°	-2.5	64.8	
171.79	54.5		2.0	180°	-8.6	63.1	
206.16	59.1	58.2	2.0	0°	-3.3	61.5	
240.52	37.9		2.0	180°	-24.0	61.9	
NO FREQUENCIES FOUND ABOVE 300MHz							

* DELTA = METER READING - CORRECTED LIMIT

**RADIATED EMISSIONS**COMPANY NAME: TELECTRA INT., INC. DATE: 1-8-99EUT: AUTOMOTIVE IMMOBILISER EUT S/N: NONEEUT MODEL: AI 10000A LOCATION: ☐ BREA ☐ SILVERADO ☒ AGOURASPECIFICATION: FCC PT 15 CLASS: B TEST DISTANCE: 3m LAB: FANTENNA: ☒ LOOP ☐ BICONICAL ☐ LOG ☐ HORN POLARIZATION: ☐ VERT ☐ HORIZ☒ QUALIFICATION ☐ ENGINEERING ☐ MFG. AUDIT ENGINEER: J. MOUNGBAYAN

NOTES:

POLARIZATION A

Frequency (MHz)	Peak Reading (dBuV/m)	Quasi- Peak (dBuV/m)	Antenna Height (meters)	Azimuth (degrees)	Delta * (dB)	Corrected Limit (dBuV/m)	Comments
0.1342	17.4		1.0	180°	-131.8	149.2	
0.2682	2.5		1.0	180°	-134.6	137.1	
0.4026	0.5		1.0	180°	-129.6	130.1	
0.5368	0.8		1.0	180°	-124.3	125.1	
0.6710	2.6		1.0	180°	-118.6	121.2	
0.8052	0.4		1.0	180°	-117.7	118.1	
0.9394	2.5		1.0	180°	-112.9	115.4	
1.0736	0.5		1.0	180°	-112.6	113.1	
1.2078	0.4		1.0	180°	-110.6	111.0	
1.3420	0.5		1.0	180°	-108.7	109.2	

* DELTA = METER READING - CORRECTED LIMIT

RADIATED EMISSIONS

COMPANY NAME: TELECTRA INT., INC. DATE: 1-8-99

EUT: AUTOMOTIVE IMMOBILIZER EUT S/N: NONE

EUT MODEL: AI100DA LOCATION: ☐ BREA ☐ SILVERADO ☐ AGOURA

SPECIFICATION: FCC PT.15 CLASS: B TEST DISTANCE: 3m LAB: F

ANTENNA: ☒ LOOP ☐ BICONICAL ☐ LOG ☐ HORN POLARIZATION: ☐ VERT ☐ HORIZ

☒ QUALIFICATION ☐ ENGINEERING ☐ MFG. AUDIT ENGINEER: J. MADLANGBAYAN

NOTES:

Frequency (MHz)	Peak Reading (dBuV/m)	Quasi- Peak (dBuV/m)	Antenna Height (meters)	Azimuth (degrees)	Delta * (dB)	Corrected Limit (dBuV/m)	Comments
0.1342	14.5		1.0	270°	-134.7	149.2	
0.2682	0.9		1.0	270°	-136.2	137.1	
0.4026	0.7		1.0	270°	-129.4	130.1	
0.5368	1.0		1.0	270°	-124.1	125.1	
0.6710	4.5		1.0	270°	-116.7	121.2	
0.8052	0.6		1.0	270°	-117.5	118.1	
0.9394	2.1		1.0	270°	-113.3	115.4	
1.0736	3.3		1.0	270°	-109.8	113.1	
1.2078	0.9		1.0	270°	-110.1	111.0	
1.3420	0.2		1.0	270°	-109.0	109.2	

* DELTA = METER READING - CORRECTED LIMIT

STOP CURSOR CURSOR

500ns

100ns

Type

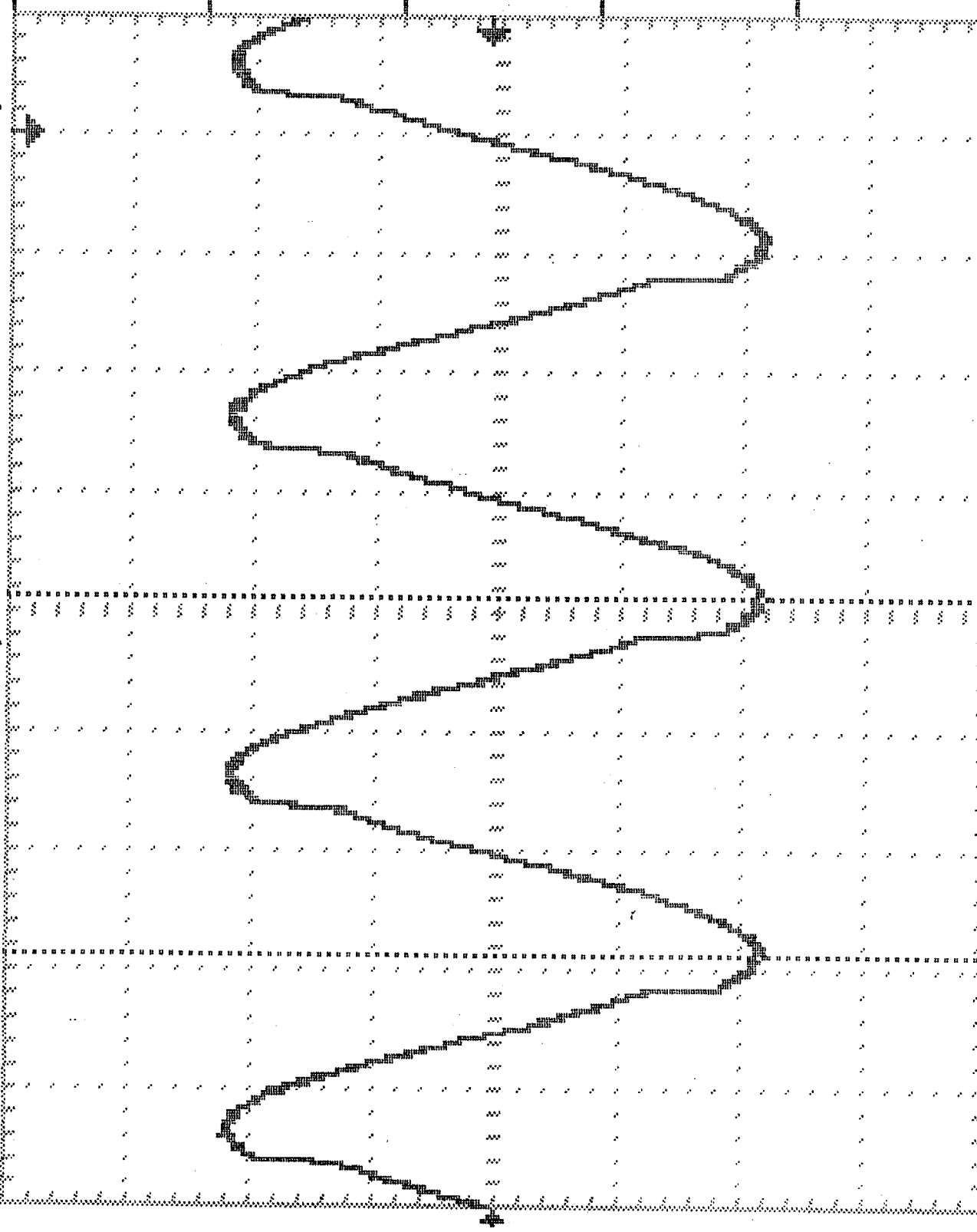
Source

Delta
7500ns
133.3kHz

Cursor 1
-1720ns

Cursor 2
-9700ns

CH1 320mV CH2 100mV



12K

11

Stop

M Pos: 98.00ms

CURSOR

Type

Time

Source

CH1

Delta

92.00ms

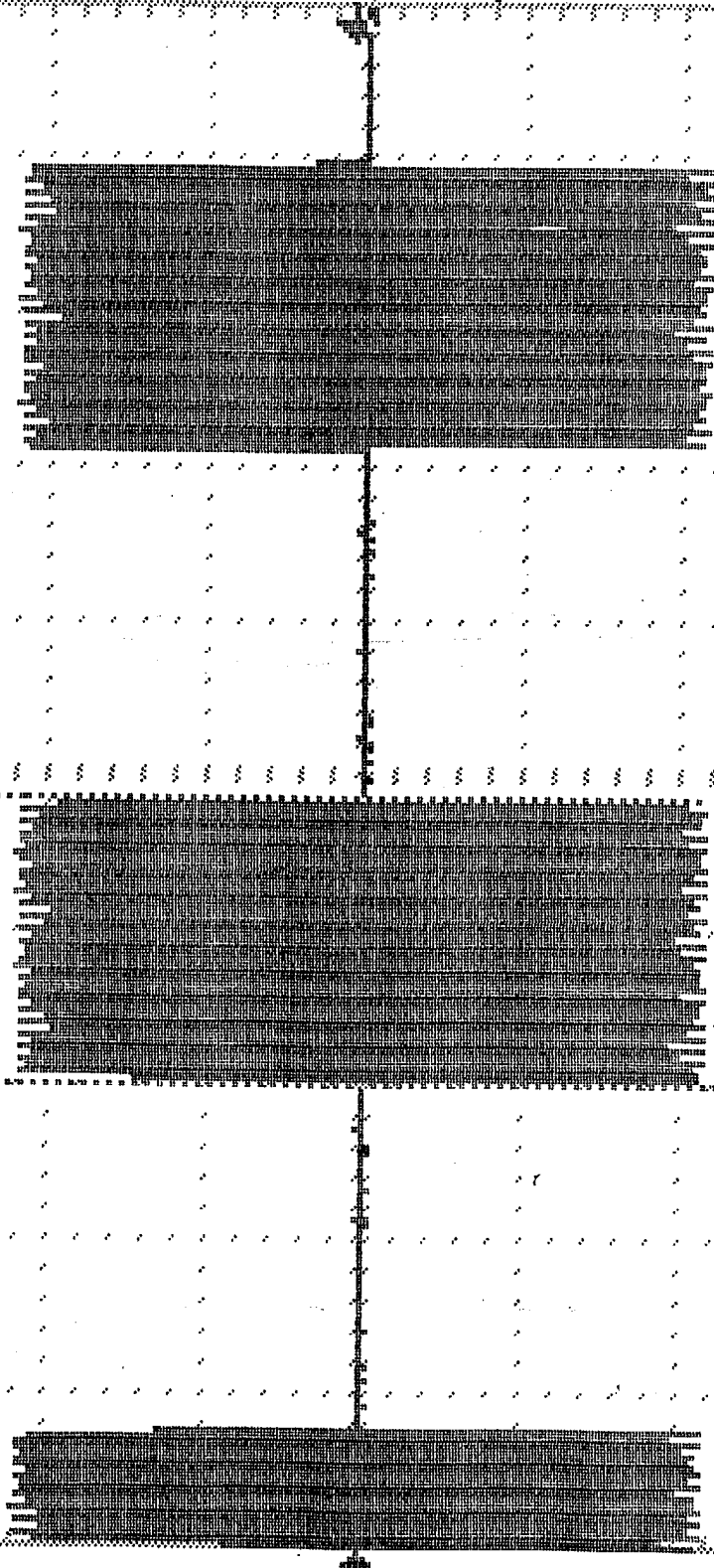
10.87 Hz

Cursor 1

-2.000ms

Cursor 2

90.00ms



CH1 920ms

M 50ms

CH2 100ms

CH3 100ms

CH4 100ms