

Intentional Radiator
15.209 Certification

FCC ID: OCFMA-3002

EMI TEST REPORT

on

Triad T-IN-2 Car Security System

Prepared For

Dealer Security Solutions
11379 Trade Center Dr. #330
Rancho Cordova, CA 95742
TEL: (916)851-9073
FAX: (916) 851-9075

Prepared by

Electronic Compliance Laboratories, Inc.
1249 Birchwood Drive
Sunnyvale, CA 94089
408/747-1490

Test Report Number: A811013

Date of Test: October 1, 1998

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1.0 Certification of Compliance

Description: Car security system using a low power transmitter operating at 134 kHz

Model Number: Triad 1, Triad 2

Serial Number: Prototypes

Applicant: Dealer Security Solutions

Type of Test: FCC-15, Class A (Certification) part 15.209

Date of Test: October 1, 1998

Tested By: Shawn McGuiness

The above equipment was tested by Electronic Compliance Laboratories, Inc. and found to be in compliance with the requirements set forth in the FCC Rules and Regulations, Part 15, Subpart C (15.203, 15.205, 15.209). The equipment, in the configuration described in this report, shows that the maximum emission levels emanating from this equipment are within the compliance requirements.

Chris Byleckie
Technical Director

Date

2.0 General Information

Applicant: Dealer Security Solutions
11379 Trade Center Dr. #330
Rancho Cordova, CA 95742

Contact Person:
Equipment Under Test: Triad T-IN-2
Serial Number: prototype
FCC ID#: OCFMA-3002
Report Number: A811013
Date of Test: October 1, 1998
Manufacturer: Dealer Security Solutions

Type of Test: FCC part 15, Subpart C, (15.203, 15.205, 15.209), Class A Digital Device.

Frequency Range: 30 MHz to 1000 MHz - Radiated Emissions, Class A
134 kHz to 1.34 MHz

Summary

Pass/Fail: Passed

15.209 Radiated Emissions:

The Triad meet all the requirements for Part 15.209 Class A limit. **See Appendix D for Data Sheet and plots.**

3.0 Test Facility

Name: Electronic Compliance Laboratories

Location: 1249 Birchwood Drive
Sunnyvale, CA 94089

Site Filing: A site description is on file at the Federal Communications Commission
P.O. Box 429
Columbia, MD 21045

Types of Sites: Open Field Radiated and Indoor (Screen Room).
Line Conducted: All sites are constructed and calibrated to meet
ANSI C63.4-1994 requirements.
Test facility is recognized by the National Voluntary Laboratory
Accreditation Program for satisfactory compliance with criteria
established in Title 15, Part 285 Code of Federal Regulations.

NVLAP Code: 20089 effective through: March 31, 1999

4.0 Test Equipment

The following list contains equipment used at EC Laboratories, Inc. for compliance testing. The equipment conforms to the American National Standard Specifications for Electromagnetic Interference and Field Strength Instrumentation from 10 kHz to 1000 MHz.

Description	Manufacturer	S/N	Model No.	Cal. Due Date
EMI Receiver	HP	3325A00137	8456A	5/3/99
Pre-amp	HP	313A06829	8447F	5/10/99
Pre-amp	HP	3008A00527	8449B	4/5/99
LISN	EM	2532	ANS-25/2	6/12/99
Spectrum Analyzer	HP	3137A01183	8563A	5/22/99
Plotter	HP	2644V00365	7470A	N/A
Power Meter	HP	2342A07307	435B	4/4/99
Power Sensor	HP	N/A	8482A	4/12/99
Biconical Antenna	EM	677	EM-6912	3/3/99
Log-Periodic Antenna	EM	858	EM-6950	4/18/99
Horn Antenna	EM	6231	RGA-60	6/6/98
1.2 - 4GHz Filter	FSY	001	HM1160-11SS	3/25/99
4 - 10 GHz Filter	FSY	001	HM2950-15SS	3/25/99
10 - 18 GHz Filter	FSY	001	HP8601-7SS	3/25/99

HP = Hewlett Packard

EM = Electro Metrics

The antenna used at the time the data was taken is indicated on each data page. The antenna height and polarization are also noted on the data pages.

The calibration of the measuring instruments, including any accessories that may effect such calibration, are checked frequently to assure their accuracy. Adjustments are made and correction factors applied in accordance with instructions contained in the manual for the measuring instrument.

5.0 Data Reporting Format

The measurement results are expressed in accordance with FCC Part-15, Subpart B Class B limits, where applicable, are presented in tabular or graphical form.

6.0 Detector Functions

On any frequency or frequencies below or equal to 1000 MHz, the limits shown below are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths.

On any frequency or frequencies above 1000 MHz, the radiated limits shown below are based on the use of measuring equipment employing an average detector function.

EC Laboratories uses the Peak detection mode for normal testing and initial screening of the Triad. The Peak detection mode will produce a measurement value that is always greater than, or equal to, the quasi-peak or average detection mode. Whenever the measurement value is 6 dB below the applicable limit or greater, the appropriate detector function will be employed and recorded.

7.0 Frequency Range of Investigation

The spectrum was investigated up to the frequency specified in the following table according to the highest clock frequency generated in the device.

<u>Highest Frequency Used (Clock)</u>	<u>Upper Limit of Range Measured</u>
Below 1.705 MHz	30 MHz
1.705 to 108 MHz	1000 MHz
108 to 500 MHz	2000 MHz
500 to 1000 MHz	5000 MHz
Above 1000 MHz	5th Harmonic or 40 GHz (Whichever is Lower)

8.0 FCC Class Types

Class A Digital Device

A digital device that is marketed for use in a commercial, industrial or business environment, exclusive of a device which is marketed for use by the general public or is intended to be used in the home.

Class B Digital Device

A digital device that is marketed for use in a residential environment notwithstanding use in a commercial, business and industrial environments. Examples of such devices include, but are not limited to, personal computers, calculators, and similar electronic devices that are marketed for use by the general public.

Note: The responsible party may also qualify a device intended to be marketed in a commercial, business or industrial environment as a Class B device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B digital device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a device a Class B digital device, regardless of its intended use.

(Code of Federal Regulations, 47, Part 15, Subpart A, Sect. H&I)

(CFR 47, Parts 0 TO 19, Revised as of October 1,1990)

9.0 FCC Limits

9.1 Conducted Emission Limits

For a digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back into the AC power line on any frequency or frequencies within the band 450 kHz to 30 MHz shall not exceed the limits in the following table for the appropriate class. Compliance shall be based on the measurement of the Radio Frequency voltage between each power line and ground at the power terminals. The lower limit applies at the band edges.

Frequency (MHz)	Class A Limit (μ V)	Class A Limit (dB μ V)	Class B Limit (μ V)	Class B Limit (dB μ V)
0.45 to 1.705	1000	60.0	250	48.0
1.705 to 30.0	3000	69.5	250	48.0

9.2 Radiated Emission Limits

The field strength of radiated emissions for a Class A Digital Device, when measured at a distance of 10 meters, shall not exceed the limits given in the table below. The lower limit applies at the band edge.

The field strength of radiated emissions for a Class B Digital Device, when measured at a distance of 3 meters, shall not exceed the limits given in the table below. The lower limit applies at the band edge.

Frequency (MHz)	Class A (3m) Limit (μ V/m)	Class A (3m) Limit (dB μ V/m)	Class A (10m) Limit (μ V/m)	Class A (10m) Limit (dB μ V/m)	Class B (3m) Limit (μ V/m)	Class B (3m) Limit (dB μ V/m)
30-88	300	49.6	90	39.1	100	40.0
88-216	500	54.0	150	43.5	150	43.5
216-960	700	56.0	210	46.4	200	46.0
Above 960	1000	60.0	300	49.5	500	54.0

10.0 Test Methods

10.1 Line Conducted Emissions Test Procedure

1. EUT and any other equipment and cables were placed on a wood table one meter above a ground screen.
2. The EUT's Input Power line cord was connected to a Line Impedance Stabilization Network (LISN) under the table.
3. All other (Non-EUT) equipment received power from a separate AC Power Source. The LISN assembly has two monitoring points: Line 1 (AC-Hot) and Line 2 (AC-Neutral). Each monitoring point was scanned by the measuring equipment (the other point was terminated in 50 ohms) over the frequency range of 450 kHz to 30 MHz for conducted emissions.
4. When an emission is found, the following takes place:
 - a. The emission levels are maximized by equipment/cable placement.
 - b. Frequency and emission level data are entered into computer in dBm.
 - c. The monitoring point (Line 1 or 2) is entered into the computer.
 - d. The computer converts dBm to micro volts and uses a look-up table to find cable losses (in dB) at that frequency, calculates a corrected emission level, and compares the corrected emission level to the appropriate limit. The data is then printed out in tabular form.

An example of the printout and definitions follows below.

10.1 Line Conducted Emissions Test Example

Freq. (MHz)	Site Reading (dB μ V)	FCC Limit		EUT Level (L1)	
		A	B	A	B
		(dB μ V)		(dB)	
1.85	-57	69.5	48.0	-4.5	+17

Freq. = Frequency of emission in MHz

Reading dB μ V = Reading at Spectrum Analyzer (Uncorrected)

FCC Limit A/B = Conducted Emission level limit in dB μ V

EUT Level A* = Emission relative to the FCC Class A Limit

EUT Level B* = Emission relative to the FCC Class B Limit

Note = L1 is AC-Hot, L2 is AC-Neutral

QP is a Quasi-Peak value

AV is an average value

*A negative value indicates that the emission is below (or meets) the limit and a positive value indicates that the emission is above (or exceeds) the limit.

10.3 Radiated Emissions Test Procedure

1. EUT and any other equipment and cables used with the EUT were placed on a wood table one-meter above a ground screen.
2. The EUT receives the normal AC Power at the base of the table.
3. All equipment and cables are placed in a manner which tends to maximize their emission characteristics in a typical application.
4. The table was rotated 360 degrees to determine the maximum radial emissions.
5. The antenna was varied in height between 1 meter and 4 meters above the ground plane to determine the maximum emissions. Various antennas are used during the test in both the vertical and horizontal polarization.
6. The Spectrum Analyzer is scanned from 30 MHz to 1000 MHz for emissions. The applicable spectrum analyzer settings are:
 - a. Resolution Bandwidth = 100 kHz,
 - b. Normal Detector Mode = Peak (The Quasi-Peak is used when the emissions are near, or over the limit).
7. When an emission is found and maximized, the following actions are performed:
 - a. The emission frequency is entered into the computer.
 - b. The emission level is read from the spectrum analyzer in dBm and entered into the computer.
 - c. The antenna polarization is entered into the computer.
 - d. The computer converts the level in dBm to dB μ V and uses lookup tables to determine the coax cable loss, antenna factor, and pre-amp gain. A site correction factor is calculated for that particular frequency, and the data is printed out in tabular form.

10.4 Radiated Test Example

Freq. (MHz)	Site Reading (dB μ V)	FCC Limit		EUT Level (QP)	
		A	B	A	B
		(dB μ V)		(dB)	
65.4	-58	39.1	40.0	-4.6	-5.5

Freq. = Frequency of emission in MHz.

Reading dB μ V = Reading at Spectrum Analyzer (Uncorrected)

FCC Limit A/B = Limit in dB μ V as stated in Part-15, Subpart B

EUT Level A* = Emission level relative to the FCC Class A limit

EUT Level B* = Emission level relative to the FCC Class B limit.

Note = V/H is the antenna polarization (Vertical or Horizontal)

PK indicates a Peak Value

QP indicates the Quasi-Peak value.

*A negative value indicates that the emission is below (or meets) the limit and a positive value indicates that the emission is above (or exceeds) the limit.

11.0 Labeling Requirements

Product Label:

A Class A Digital Device subject to Certification by the FCC shall bear the following statement in a conspicuous location on the device.

(Name of Grantee)

FCC ID:

This device complies with Part 15 of the 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.

The label is to be located in a "conspicuous location". This is any location readily visible to the user of the device without the use of tools.

The label is to be permanently attached to the equipment in such a manner that the label can normally be expected to remain fastened and legible during the equipment's expected useful life.

Where the device is constructed in two or more sections connected by wires and marketed together, the statement specified in this section is required to be affixed only to the main control unit.

When the device is so small or for such use that it is not practicable to place the statement specified above on it, this required information shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier must be displayed on the device.

Users Manual Statement:

For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the user's operation manual.

NOTE: This equipment has been tested and found to comply with the limits for Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. 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. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense:

12.0 Summary of Measurements

CFR Title 47, Part 15.209

Manufacturer: Dealer Security Solutions.
11379 Trade Center Dr. #330
Rancho Cordova, CA 95742

Contact:
FCC ID: OCFMA-3002
Test Report Number: A811013

The DSS Triad is a car security system that is used by automobile dealers to help prevent auto theft. The Triad uses a very low power transmitter that operates at 134 kHz frequency band. See the Theory of Operation sent as a separate attachment.

Intentional radiator operating below 1.705 kHz

15.209 Radiated Emissions

The Triad was operating normally during this test. The Triad was placed near one edge of a wooden table resting on a turntable. The wooden table was approximately 1 meter above the groundplane of the 3 meter test site. Due to the extremely low output power of the Triad the search antenna was located at 1 meter. Measurements were made in accordance with ANSI C63.4-1994.

There were no emissions visible above the noise floor.

Test Data is in Appendix B.

The transmitter output was measured at 1 and 3 meters. The output levels of the product were extremely low.

The duty cycle correction factor of 6 dB was calculated as follows:

Data Transmission Pulse width	=15s
Pulse Repetition	=30s
Duty Cycle	=15/30 = 0.5
Duty Cycle Correction Factor (dB)	= $20\log(0.04)$ = -6.0 dB

Transmitter data is in Appendix A.

15.205 Restricted Band

The Triad has no emissions in the restricted bands.

15.203 Antenna Connector

The Triad uses an antenna that is soldered to the PC board and is not removable..
Manufacturers drawing for the antenna is in Appendix C.

APPENDIX A
Transmitter Data

EUT:	Triad	DATE:	12/31/98						
Rule Part:	15.209	CUSTOMER NAME:	DSS						
		WORK ORDER:	8100102						
		FILE:	8100102.xls						
Antenna:	Rod	ATTN dB:	0.0						
Modulation Type:		DUTY dB:	6.0						
Tested By:	Shawn	HP IL dB:	0.0						
Comments:	1 meter antenna distance used CISPR avg. detector	DIST dB:	50 from .009 to .490MHz 30 from .49 to 1.705 MHz						
FREQ. MHz	READING dB(uV)	Pk, QP, or Av	A.F. dB	Cable loss dB	AMP dB	O.C.F. dB	TOTAL, dB(uV/m)	LIMIT dB(uV/m)	DELTA dB
0.136	62.6	Av	17.3	0.2	0.0	56.0	24.06	25.0	-0.9
0.277	19.6	QP	17.2	0.2	0.0	50.0	-12.98	25.0	-38.0
0.412	28.4	QP	17.2	0.2	0.0	50.0	-4.16	25.0	-29.2
0.549	15.3	QP	17.1	0.3	0.0	30.0	2.68	45.0	-42.3
0.684	22.4	QP	17.1	0.3	0.0	30.0	9.78	45.0	-35.2
0.822	25.0	QP	17.1	0.3	0.0	30.0	12.41	45.0	-32.6
0.956	26.5	QP	17.1	0.3	0.0	30.0	13.83	45.0	-31.2
1.090	24.0	QP	16.9	0.3	0.0	30.0	11.25	45.0	-33.8
1.362	23.8	QP	16.9	0.3	0.0	30.0	10.98	45.0	-34.0
1.497	15.0	QP	16.9	0.3	0.0	30.0	2.19	45.0	-42.8

FCC RADIATED DATA SHEET

EUT:	Triad	DATE:	12/31/98
Rule Part:	15.209	CUSTOMER NAME:	DSS
		WORK ORDER:	8100102
		FILE:	8100102.xls

Antenna:	Rod	ATTN dB:	0.0
Modulation Type:		DUTY dB:	0.0
Tested By:	Shawn	HP IL dB:	0.0
Comments:	3 meter antenna distance used CISPR avg. detector	DIST dB:	40 from .009 to .490MHz 20 from .49 to 1.705 MHz

FREQ. MHz	READING dB(uV)	Pk, QP, or Av	A.F. dB	Cable loss dB	AMP dB	O.C.F. dB	TOTAL, dB(uV/m)	LIMIT dB(uV/m)	DELTA dB
0.136	43.2	Av	17.3	0.2	0.0	40.0	20.66	25.0	-4.3
0.277	42.5	Pk	17.2	0.2	0.0	40.0	19.94	25.0	-5.1
0.412	25.6	Av	17.2	0.2	0.0	40.0	3.04	25.0	-22.0
0.549	40.5	Pk	17.1	0.3	0.0	20.0	37.89	45.0	-7.1
0.687	30.8	Pk	17.1	0.3	0.0	20.0	28.18	45.0	-16.8
0.822	40.0	Pk	17.1	0.3	0.0	20.0	37.41	45.0	-7.6
0.956	43.3	Pk	17.1	0.3	0.0	20.0	40.68	45.0	-4.3
1.090	39.4	Pk	16.9	0.3	0.0	20.0	36.62	45.0	-8.4
1.362	38.7	Pk	16.9	0.3	0.0	20.0	35.92	45.0	-9.1
1.497	21.8	Pk	16.9	0.3	0.0	20.0	19.00	45.0	-26.0

APPENDIX B

15.209 Radiated Emissions Data

Electronic Compliance Laboratories, Inc.
1249 Birchwood Ave.
Sunnyvale, CA

Radiated Emissions
Frequency range: 30MHz-1000MHz

3 Meter Open Site
Site Calibrated: June 1997

Government Agency and Limit: FCC Class B

QP = Quasi-Peak Note: Ignore peak readings when Quasi-Peak reading exists
PK = Peak

Customer: DSS INC Operator: SHAWN
Date: 10-01-1998 Time: 15:01:15
Temperature Range: 78 Deg F Percent Humidity: 50
E.U.T.: TRIAD
Serial Number: PROTO
Modifications: None
Report File Name: F:\TESTDATA\8100102.RF

Antenna Type: BICONICAL

TEST FREQ	TEST dBuV	ACTUAL dBuV/m	CLASS B LIMIT	VERSUS B LIMIT	TABLE DEGREES	ANTENNA HEIGHT	POLAR- IZATION	DETECTOR Type
=====	=====	=====	=====	=====	=====	=====	=====	=====

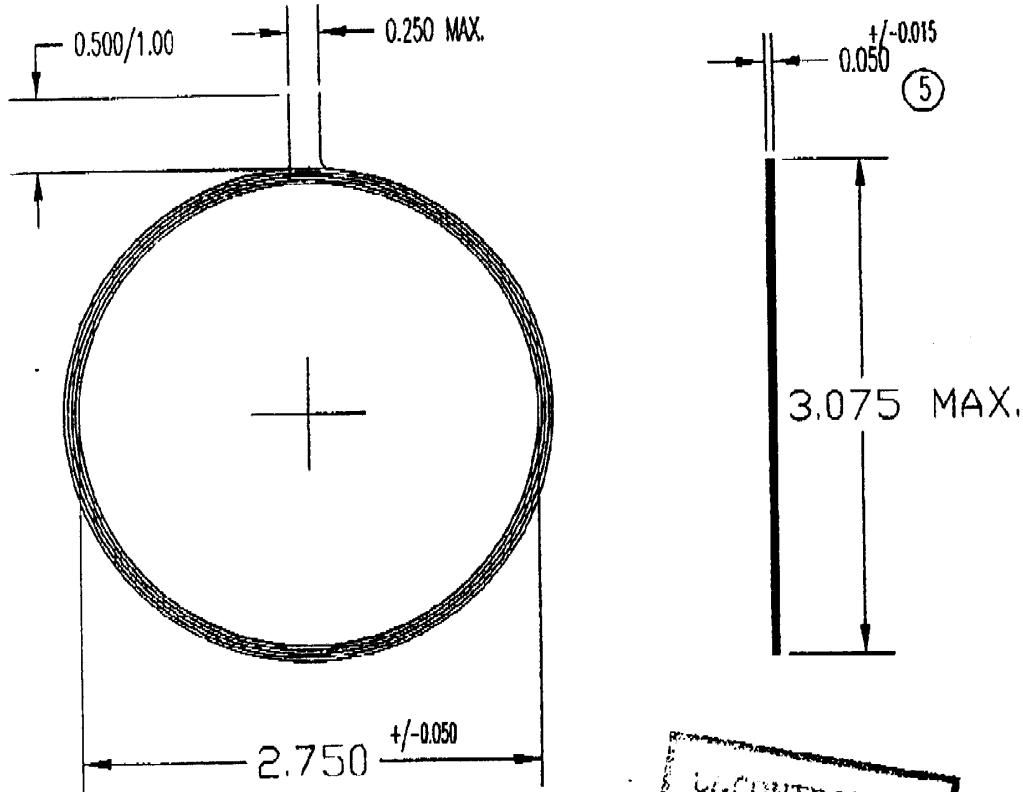
NOTE: NO DETECTABLE EMISSIONS FOUND

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APPENDIX C

Antenna Information

FILE: CDS0003-000		DESCRIPTION	DATE	APP.
ECN	REV.			
N/A	*	NUEVA EMISION	10/08/98	O.R.



NOTES:

1. ALL DIMENSIONS ARE IN INCHES
2. MATERIAL: MAGNET WIRE #26 LOW TEMP
3. TURNS: 16 +/- 0
4. INDUCTANCE: 44 uH +/- 3 % @ 100 KHz
5. THICKNESS: 0.050 +/- 0.015 WITHOUT CROSS OVER

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DEALER SECURITY SOLUTIONS.

DEALER SECURITY SOLUTIONS		TITLE	
FINISH	MATERIAL	REVISION	USED ON
	MGT. WIRE #26 LOW TEMP	10/08/98	ASSYS. COILS
		DRAWN S. GONZALEZ	CHK'D S. GONZALEZ
		SCALE 1:1	APPROD [Signature]
			DWG. OR PART NO. CDS0003-000

TOLERANCES ON ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED:
DECIMALS (2 PLACE) +/- .015, (3 PLACE) +/- .005
HOLE DIAMETERS +/- .003, ANGLES +/-

FILE:	CON. REF.	DESCRIPTION	UNIT. AMT.
	4	NEW DISK.	1/24

CDE COPIA CONTRACUBADA
COPIA NO. 1 FECHA 07/22/98
COPIA NO. 1 VÁLIDA EN NEGRO

CDE ASSY COIL
CUSTOMER: DEALER SECURITY.
ITEM: 1
ORIGIN: HA
SCALE: 1:1
DATE: 07/22/98
DOC. NO. 000001-000

CDE CORNELL-DUBILIER ELECTRONICS
FINISH: MATERIAL: TITLE: ASSY COIL
ITEM: 1
ORIGIN: HA
SCALE: 1:1
DATE: 07/22/98
DOC. NO. 000001-000

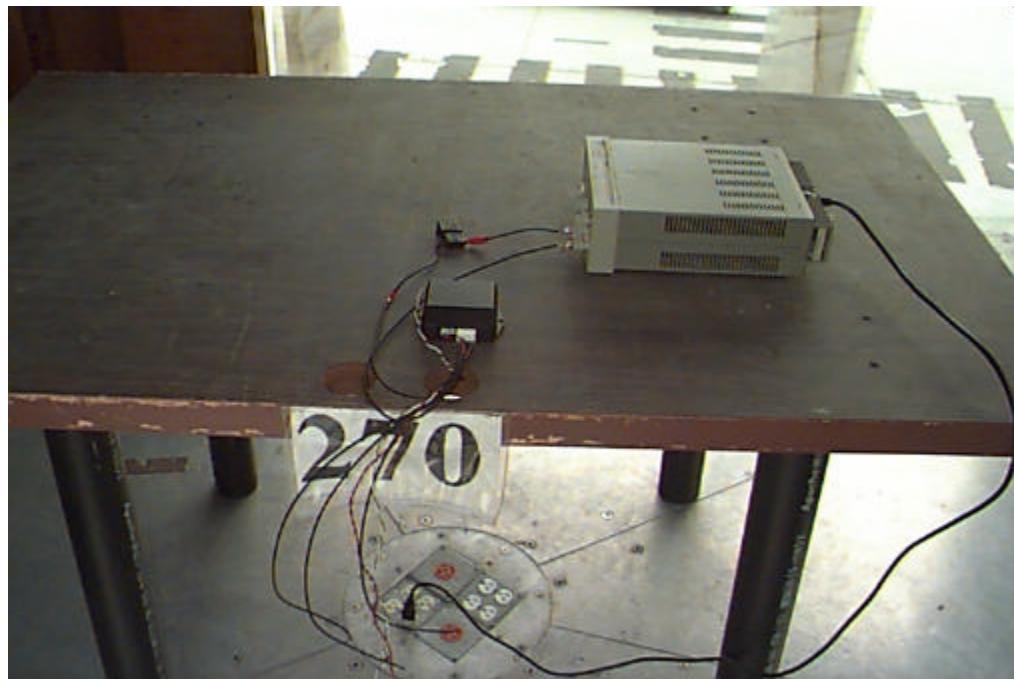
7.- USE SOLDADURA SINTERIZADA
1.- CABLE BLANCO/NEGRO 24 AWG 7/32 TWISTED PAIR

**1: PONER CONECTOR, INSERIENDO
 EL CABLE NEGRO EN POSTINO DEL
 CONECTOR.**
**2: COLOCAR TUBO DA 1/8 X 1/2 DE LONGITUD
 ENRABUDAR Y SOLDAR EN CRESOL.**
3: COLOCAR TUBO DA 1/4 X 1" LONGITUD.
4: ACCOJER ALGOS ALGOS TUBOS Y APLICAR COLOR.
**5: SUMERIR 3 VECES EN PINTURA AGRADA
 COLOR NEGRO.**
6: PRUEBA ELECTRICA HACER 0.45 VOLTS
**NOTA: NO ES PERMITIDO QUE SE VEA LA PINTURA
 UNA VEZ PINTADA LA PEA.**

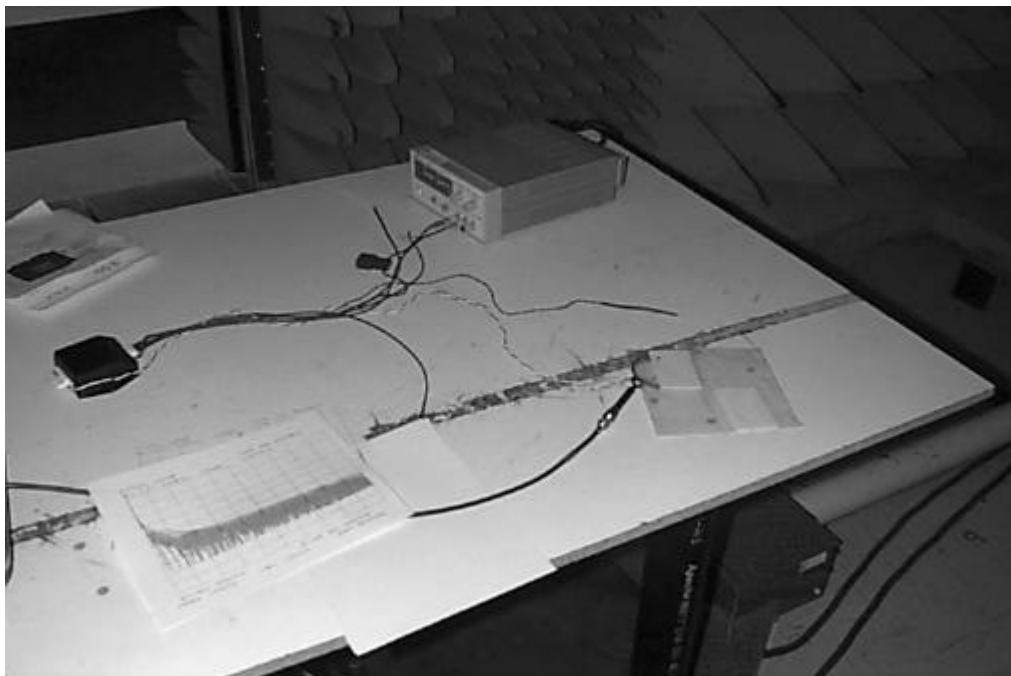
TOTAL P.03

APPENDIX D

Test Set-up Photographs



15.209 Radiated Emissions



15.205 Restricted Band