Integrated Information Systems Group
8201 E. McDowell Road
Scottsdale, AZ 85252-1417

Report No. WSSD041200

Class II Permissive Change Report

Bistatix BXR-610

Access Control Reader

FCC ID: E9UBXR610

Model No. PVT-250

Equipment Manufacturer:	**Indala Corporation *(subsidiary of Motorola, Inc.)* 3041 Orchard Parkway San Jose, CA 95134**
Tests Conducted By:	**Motorola IISG EMC Test Facility 8201 E. McDowell Rd. Scottsdale, Arizona 85252**
Tests Period:	**November 1st to November 8th, 2000**
Test Summary:	**Complies with FCC Part 15, Subpart C, Unlicensed Low Power Transmitters**

The Motorola SSG EMC/TEMPEST Laboratory is accredited through the NVLAP®

NVLAP Lab Code 100405-0

6.0 Introduction

6.0.1 Product Description

The Motorola BiStatix BXR-610 reader is a modular, miniaturized and rugged low power radio frequency reader designed for applications such as identification systems, security systems, Access Control, and data collection. The BXR-610 mounting bracket accommodates a wide variety of foreign and domestic electrical utility box applications and can be easily modified for unique circumstances.

The reader outputs data in Wiegand, ABA Track II, magnetic stripe or RS-232C formats, making it easy to upgrade an existing site to proximity using the wiring already in place.

Product Specifications:

Frequency of Operation

-Excitation	125 kHz Typical
-Data Carrier	62.5 kHz Typical
-Data Rate	7.8125 kbits/second Typical

6.0.2 Facility Description

EMI testing of the BXR-610 Reader was performed at the Motorola Integrated Information Systems Group's (IISG) EMI/TEMPEST Test Laboratory. This test laboratory is located in the southeast wing of the Hayden building at 8201 E. McDowell Road, Scottsdale, AZ.

Motorola IISG Test Facility Address:

Motorola, Inc.
Integrated Information Systems Group
Hayden EMC Facility
8201 E. McDowell Rd. M/D H2550
Scottsdale, AZ 85252

The facility has been found to be in compliance with the requirements of Section 2.948 of the FCC rules, per FCC letter 31040/SIT, 1300F2, dated October 6, 1998. The facility has also been issued a Certificate of Accreditation through the National Voluntary Laboratory Accreditation Program (NVLAP) by NIST. This is under NVLAP Code: 100405-0 and is effective through September 30, 2001.

6.0.3 Quality System

The EMI/TEMPEST Test Laboratory maintains a Quality Manual that describes the quality assurance program of the EMC/TEMPEST Facility to set forth procedures covering all quality assurance functions. This manual has been constructed to reflect a quality program in compliance with the requirements of the following:

- National Institute of Standards & Technology (NIST) National Voluntary Laboratory Accreditation Program (NVLAP)
- NIST/NVLAP EMC MIL-STD 462 Program Handbook (Apr. 1994)
- NVLAP EMC and Telecommunications FCC Methods Handbook 150-11 (Apr. 1995)
- MIL-Q-9858A, MIL-STD 461, 462, 463, 461D, 462D
- National Security Agency Technical and Security Requirements Document for the Endorsed TEMPEST Test Services Program, NSA TSRD No. 88-8B, 5 Oct. 1993
- System Solution Group of Motorola Quality Six Sigma Program.

6.0.4 Standard References

47 CFR 2	Code of Federal Regulations, Title 47, Part 2, "Frequency Allocations and Radio Treaty Matters; General Rules and Regulations"
47 CFR 15	Code of Federal Regulations, Title 47, Part 15, "Radio Frequency Devices" Subpart C, "Intentional Radiators"
C63.4-1992	American National Standards Institute (ANSI), "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz"

6.1 Test Procedures

6.1.1 Requirements

The BXR-610 reader is subject to FCC Part 15, Subpart C and Part 2 for FCC Certification for units marketed within the United States. The following tests, as specified in FCC Part 2, with limits as defined in FCC Part 15, and shown in Table 6.1-1 below were performed on the access control reader.

Table 6.1-1 Tests Required for Certification of the 125 kHz BXR-610 Reader

Test Parameter	**FCC Part 2** **Paragraph Number**	**FCC Part 15** **Paragraph Number**	**FCC Part 15** **Limit**
Field Strength of Spurious Emissions	2.1053	15.209	**Freq (MHz) Limit (uV/m) d (m)** .009-0.490 MHz 2400/F(kHz) 300m 0.490-1.705 MHz 24000/F 30 m 1.705-30 MHz 30 30 m 30-88 MHz 100 3 m 88-216 MHz 150 3m 216-960 MHz 200 3m Above 960 MHz 500 3m
Restricted Bands of Operation		15.205	Does not operate in any restricted bands; Spurious requirements same as 15.209

6.1.2 Operational Configuration

The BXR-610 Access Control Reader was tested in its typical operational configuration. The BXR-610 unit was set up and operated in a continuous transmit mode at the frequency of 125 kHz and at its maximum rated output power for all tests. All testing was done in a radiated test setup since the antenna is an integral part of the unit. A general test setup is shown as Figure 6.1-1.

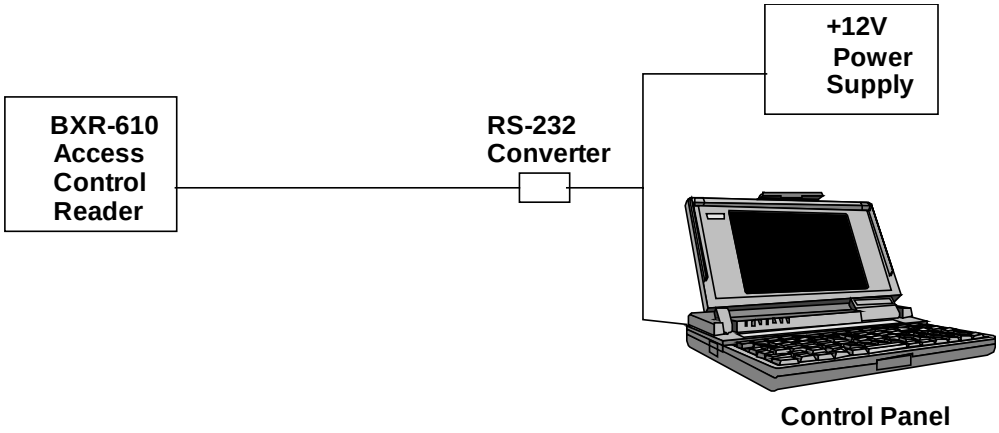

Figure 6.1-1 General Test Setup for Tests

6.1.3 Measurement Equipment

Test Equipment Nomenclature	Motorola Item Number	Manufacturer	Model Number	Cal. Date	Cal. Due
Biconilog Antenna	T47085	EMCO	3142B	10/31/00	10/31/01
Biconilog Antenna	T47086	EMCO	3142B	10/31/00	10/31/01
H-Field Loop Antenna	T36610	Electro Metrics	ALP-70	NCR	NCR
Antenna Mast	0003-2246	EMCO	2070-2	NCR	NCR
Antenna Controller	G72315	EMCO	2090	NCR	NCR
Spectrum Analyzer/ EMI Receiver	G68094	Rhode & Schwarz	ESI40	5/01/00	5/31/01
Spectrum Analyzer/ EMI Receiver	G71791	Rhode & Schwarz	ESI7	8/29/00	8/31/01

6.1.4 Radiated Spurious Emissions Procedure

Radiated spurious emission were measured over the frequency range of 9 kHz to 1 GHz in an anecohic chamber (20ft x 24ft x 16ft) and an open area test site (OATS). Refer to Figure 6.1-2 and 6.1-3 for test setups.

The radiated emissions between 9 kHz and 30 MHz, including the carrier level, were measured in an anechoic chamber using a shielded magnetic loop antenna at a 3 meter distance. The levels were extrapolated to the required test distance defined in 47 CFR Part 15 using the square of an inverse linear distance formula. These emissions were maximized by rotating the equipment on the turntable. When the using the magnetic loop antenna it was also rotated along its vertical axis.

The radiated emissions above 30 MHz were initially measured in a semi-anechoic shield room in order to identify the emissions before proceeding to the open area test site (OATS). This provides the capability of taking accurate measurements in a higher ambient environment such as at the rooftop OATS. The Rohde & Schwarz EMI Receiver System was used for the pre-scans. Typically, signals within approximately 10 dB of the limit are noted for measurements on the OATS.

Final measurements on the OATS were taken with a Rohde & Schwarz EMI Receiver System, ESI7, with preselector at a 3 meter test distance from the receiving antenna. The Smartcard Reader was placed on a .8 meter high non-conductive table on a rotating turntable which is flush with the site ground plane. The receiving antenna was scanned over a height range from 1 to 4 meters in both antenna polarities, and the turntable was rotated 360 degrees. The highest emissions were recorded and the final field strength level determined using the following formula:

Field Strength (dBuV/m) = Measured Level (dBuV) + Cable Loss (dB) + Antenna Factor (dB)

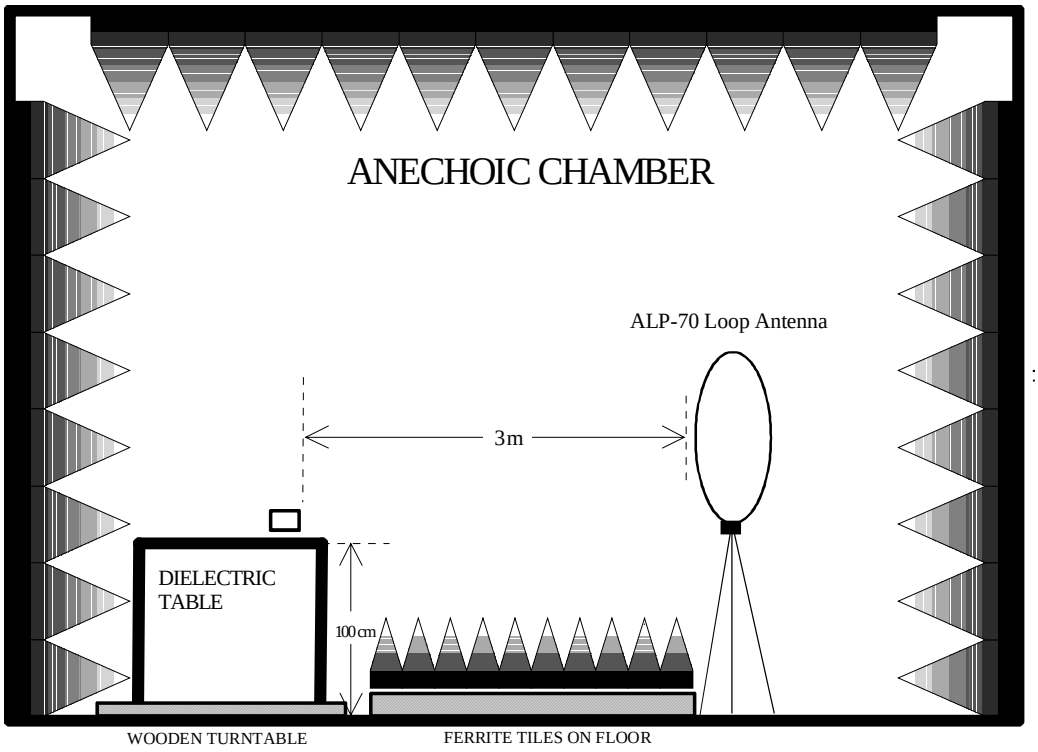

Figure 6.1-2 Radiated Spurious Emissions Test Setup - Chamber

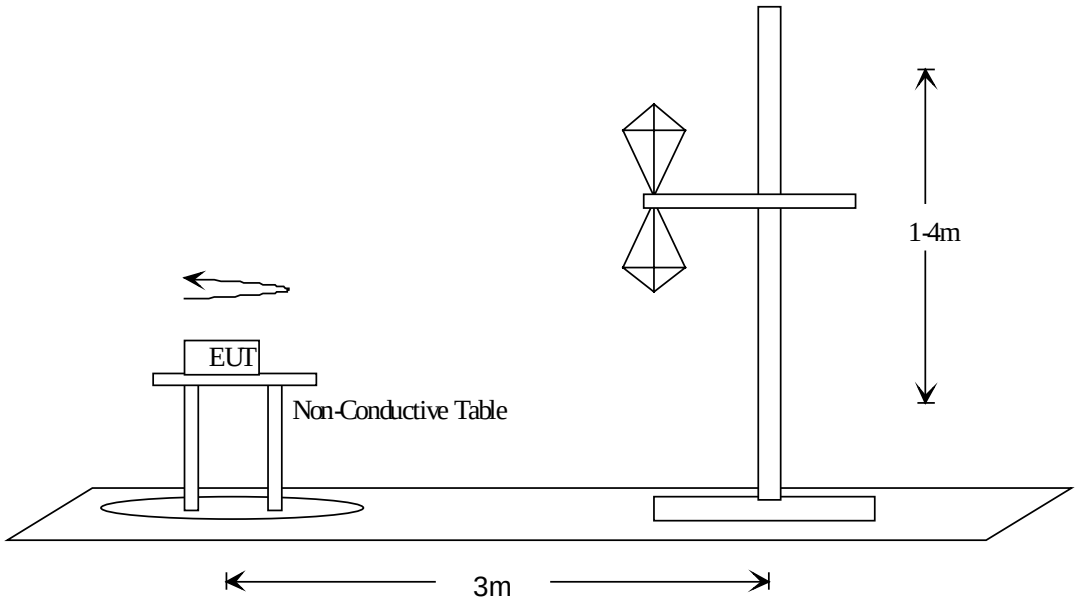

Figure 6.1-3 Radiated Spurious Emissions Test Setup -OATS

6.2 Test Results

6.2.1 Radiated Spurious Emissions Measurement Test Results

All measurements were made with the BXR-610 transmitting at its maximum rated output power. The antenna is an integral part of the unit and the unit is continuously transmitting at 125 kHz. The maximized carrier level at the frequency of operation was 79.13 dBuV/m @ 3 meters (-0.87 dBuV/m @ 300 m) worst case using a shielded magnetic loop antenna. This was well below the 25.7 dBuV/m limit at 300 meters specified in 47 CFR Section 15.209 at the operating frequency of 125 kHz. Measurements were performed in an anechoic chamber at a distance of 3 meters with the measured data corrected to the 300 meter distance using a 40 dB/decade factor.

The radiated emissions for the frequency range of 9 kHz to 30 MHz were all below the applicable limits of 47 CFR 15.209 including the carrier harmonics. These measurements were also performed in an anechoic chamber at a distance of 3 meters and extrapolated to the required distances defined in 15.209. These scans were taken with an automated EMI Receiver system using scan tables setup specifically for the requirement conditions including bandwidth, transducer factors, and distance correction. The worst case emissions graph is shown as Figure A-1.

Measurements for 30 MHz to 1 GHz were taken first in the semi-anechoic chamber in order to identify the critical frequencies. Signals which were within 10 dB of the limit were recorded and their final measurement was taken on the OATS. The measurements were taken at a test distance of 3 meters per the specification. All emissions in this range were below the specification limits of 47 CFR Section 15.209 as shown in the data sheet of Figure B-1. The emission at 31.8 MHz was the worst case emission measuring -4.0 dB below the specification limit. There was also a broadband noise signal between the frequencies of 37 to 47 MHz which measured -6 dB below the limit.

Additionally, this equipment complies with the requirements of 47 CFR Section 15.205 on Restricted Bands of Operation. The BXR-610 operating frequency of 125 kHz is outside of any of the restricted bands specified in 15.205. Spurious emissions are permitted in these bands with the condition that they comply with the same requirements of 15.209 as tested.

A representative setup photo is shown as Figures C-1.

Appendix A

Radiated Spurious Emission Measurements

9kHz to 30 MHz

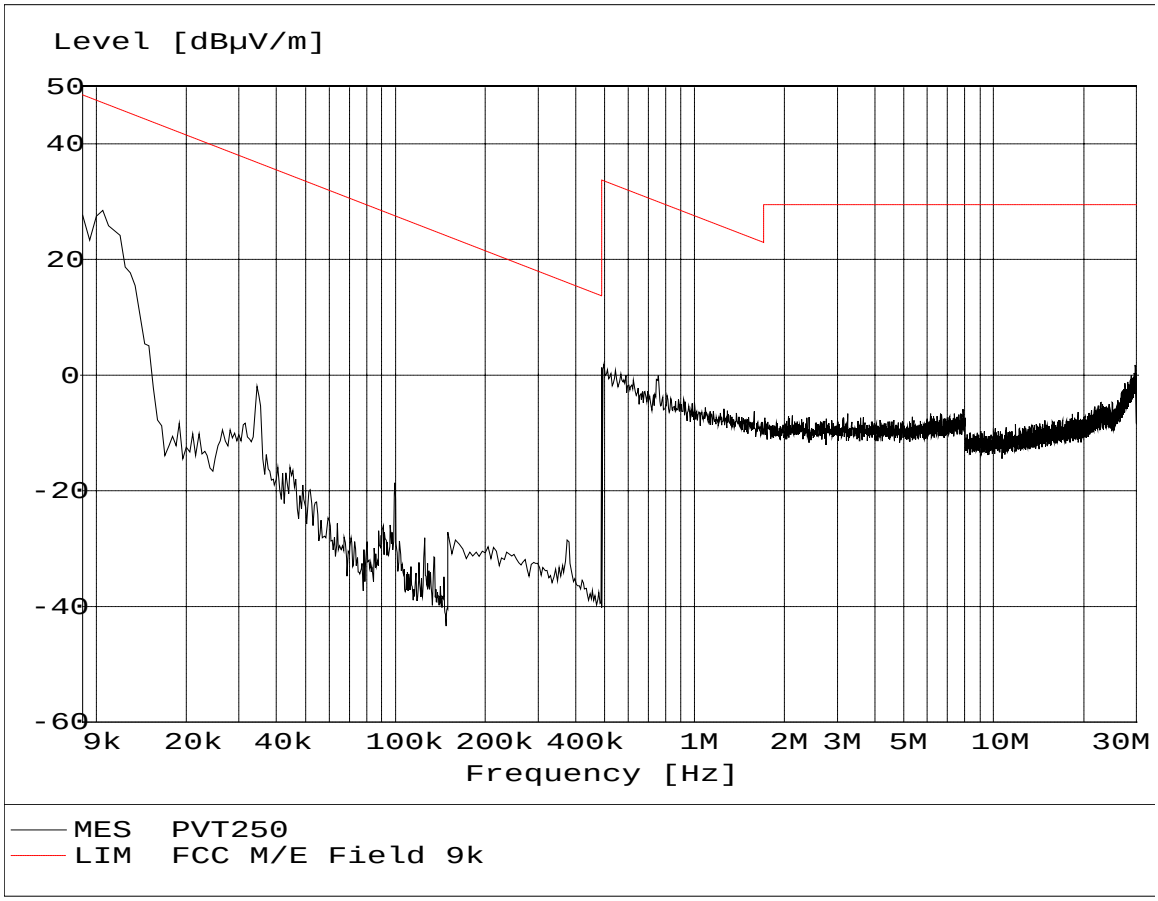

Figure A – 1 Radiated Spurious Emissions, 9 kHz to 30 MHz, Loop Antenna

Appendix B

Radiated Spurious Emission Measurements

30 MHz to 1000 MHz

MOTOROLA IISG TEST DATA SHEET

FCC Radiated Test Results

Comments:

Equip.	BiStatix	Test Date:	11/3/00
Mode:	On	Test Technician:	R. Johnston
Model#:	PVT-250	Measurement Distance (m)	3
Serial #:	E.M.01	Equipment Class	B

Bold Reading are Quasi Peak — 67° Hum 40.% BP 29.93 F

Frequency MHz	SA Reading (dBuV)	Az	Ht cm	Pol	Antenna Factor	Cable/Attn. Loss	Pre Amp dB	Emission (dBuV/m)	Spec Limit (dBuV/m)	Deviation from Spec. Limit (dB)	
31.800	**12.7**	FL	100	V	15.6	7.6	0.0	36.0	40.0	-4.0	
41.640	**15.5**	F	100	V	10.7	7.8	0.0	34.0	40.0	-6.0	BB Sig 37-47MHz
48.000	**16.3**	F	100	V	8.8	8.1	0.0	33.2	40.0	-6.8	Measured in Chamber
115.200	**11.7**	F	100	V	7.3	9.0	0.0	28.0	43.5	-15.5	
122.400	**16.4**	F	340	H	8.0	9.2	0.0	33.5	43.5	-10.0	
131.000	**19.20**	F	300	V	6.5	9.5	0.0	35.2	43.5	-8.3	
145.400	**14.9**	F	100	V	7.6	9.7	0.0	32.1	43.5	-11.4	
149.600	**13.12**	F	100	V	8.1	9.6	0.0	30.8	43.5	-12.7	
156.352	11.74	F	198	V	9.0	9.5	0.0	30.2	43.5	-13.3	20kHz
168.016	**9.20**	F	200	V	8.8	9.4	0.0	27.4	43.5	-16.1	20kHz

Figure B – 1 Radiated Spurious Emissions, OATS Data, 30 MHz to 1 GHz

Appendix C

Test Setup Photo

BXR-610 PROPOSED PRODUCT DESIGN CHANGES

1. CHANGE TO 16 VOLT TRANSZORB
2. ADD SHIELD CAPACITOR
3. REMOVE EXTRA INPUT/OUTPUT CIRCUITS
4. 0.22 μF CAPACITOR
5. 1206 CAPACITOR TO 1210 CAPACITOR
6. REMOVE C57 & C59 PADS

CHANGE #1

This design change is an increase in the Transzorb trip amplitude on the DC Power Input, J1-1. This involves a change of Z1 from the 15V Part, 1SMB15CATC, to a 16V Part No. 1SMB16CATC.

CHANGE #2

2A) A 0.15 μF capacitor located between J1-5 and J1-6 interface to be incorporated between the cable shield and the PCB ground.

2B) A 1 kilo-ohm (kΩ) resistor chip to replace 0.1 μF capacitor C36 on ground switch pad.

CHANGE #3

This design change affects two Input/Output circuits. The pull-up transistor circuits (Q5 and Q7 respectively) in the J1-2 and J1-8 interfaces will be bypassed since they are no longer used for MUX (Multiplex). Their state does not change and therefore they will be hard wired to 5 Volts which is their normal current state. The 10 kΩ chip resistors R20 and R21 will have the pads and traces removed from the PCB.

CHANGE #4

4A) Capacitors C2 and C18, which are currently 0.22 μF to be replaced with two 0.1 μF in parallel due to a manufacturability/availability of the 0.22 μF component.

4B) A 0.01 μF capacitor will be placed in parallel with the current 0.22 μF bypass capacitors of C1 with C59 for U1, C60 with C50 for U4, and C61 with C43 for U9. This will provide a much higher self-resonance frequency.

CHANGE #5

The SMT [Surface Mount Technology] capacitor pads and trace widths are being increased to accommodate the change from a type 1206 to type 1210 device (same value but physically larger package) for C8 and C65.

CHANGE #6

Remove PCB pads for C57 & C59 since the components were never installed on the board nor are the components listed in the BOM [Build of Material].