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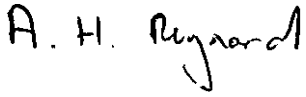
Electromagnetic Compatibility
Test Report

Test of:	RF ID Card Entry Reader
Model Number:	20442
Applicant:	PAC International LTD
Test Type:	Compliance
Test Specification:	FCC CFR47, parts 15.109 for unintentional radiators, parts 15.207 and 15.209 for Intentional Radiators.
SGS Serial Number:	DUR 21560
Date of Receipt:	28th February 2000
Date of Test(s):	3rd to 18th April 2000
Date of Issue:	22nd May 2000
Issue Number:	1

Test Engineer

L. Steel



Authorised Signatory

A. H. Reynard

CONTENTS

Page Number

1. Client Information

Company Name:	PAC International LTD.
Address:	1 Park Gate Close, Bredbury, Stockport, SK6 2SZ, United Kingdom.
Contact Person:	Mr Shaun Byrne
Telephone:	+44 161 406 3400
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2. Details Of Test Laboratory

Company Name:	SGS EMC Services LTD.
UKAS Accreditation Number:	1116
Address:	Unit 10, Bowburn South Industrial Estate, Bowburn, County Durham, DH6 5AD, United Kingdom.
Contact Persons:	Mr Alan Reynard / Mr Fred Huggins
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3. Equipment Under Test (EUT)

3.1 Identification Of EUT

Model Number:	20442
Unique Identifier:	Unique Identifier Not Supplied
Description of EUT:	The EUT is an R.F. card entry reader, designed to prevent access to restricted areas by unauthorised persons.
Fundamental (Carrier) Frequency	125 kHz Single Channel
Internal Clock Frequencies:	8 MHz
Supply Voltage:	18V DC (Via central controller)
Classification:	Intentional radiator, incorporating digital device.
Environment Class:	Commercial / Class A
Ports present:	One port comprising eight wires. Refer to configuration/peripherals section of this report for details.
Accessories Supplied:	Central Controller (refer to section 6 for full details)

4. Test Specification, Methods and Procedures

4.1 Test Specification(s)

Specification(s)	Title
FCC CFR 47 : October 1999 Parts 15.109, 15.207 and 15.209	Code Of Federal Regulations
ANSI C63.4 : 1992	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz.

4.2 Purpose Of Test

To perform the relevant tests and assess the product for compliance with the above specification (s), so that the manufacturer (PAC International Limited) can verify compliance with the specified limits.

4.3 Methods and Procedures

The standards listed on the previous page refer to the following tests:

CFR 47 Clause	Test
15.109	Radiated Emissions (Unintentional Radiator)
15.207	AC Power line Conducted Emissions
15.209	Radiated Emissions (Intentional Radiator)

5. Deviations or Exclusions from the Test Specifications

There were no deviations from the test specifications.

The scope of the inspection is limited to what is specified in the clients instructions and does not include any other checks or tests such as the electrical (electronic) control systems ability to cope with the implications of the dates falling on, before or after “January 2000”.

6. Support Equipment

The EUT was tested whilst interfaced with a central controller.

Controller Manufacturer:	PAC International Ltd
Model No.:	2200
Serial No.:	Unique identifier not supplied.

7. Operation of the EUT During Testing / Configuration and Peripherals

7.1 Operation of EUT during testing.

Refer to individual test results sections for details of EUT operation during testing.

7.2 Configuration and Peripherals

The EUT was tested whilst interfaced with a central controller. (refer to section 6 of this report for controller details).

The EUT consists of one port, comprising the following terminals, terminated as indicated:

Terminal Details	Description of termination
18V supply terminal	Controller
Ground terminal	Controller
Signal terminal	Controller
LED terminal,	Controller
Buzzer terminal,	150Ω resistor to ground
Auxiliary signal terminal,	150Ω resistor to ground
Tamper terminal	150Ω resistor to ground
1 spare terminal	150Ω resistor to ground

Note: The client states that this is the usual configuration when a PAC card reader is interfaced with a PAC controller. The terminals terminated with 150Ω resistors can be used when a non-PAC controller is used.

Terminations applied at the end of 1m lead (eight core, unscreened).

8. Test Results

8.1 General Comments

The test methods used are referred to in the individual test results sections of this test report.

8.2 Modifications Made to the EUT

No modifications were made to the EUT during the testing process.

8.3 Summary of Test Results

CFR 47 Clause	Test	Result
15.109	Radiated Emissions (Unintentional)	Complied
15.207	AC Power line Conducted Emissions	Complied
15.209	Radiated Emissions (Intentional)	Complied

Result

In the configuration tested, the EUT complies with the requirements of Clauses 15.109, 15.207 and 15.209 of CFR 47 : October 1998.

Full details of all tests can be found in the test results section of this report.

8.4 Radiated Emissions Test Results- Unintentional Radiator

CFR Clause	15.109
Limits	Class A
Frequency Range	30 – 1000 MHz

Operating Mode

The compliance test was performed with an authorised RF ID tag on the reader (door open condition).

Test Results

Worst Case Emissions

Frequency (MHz)	Quasi Peak Measurement (dBµV)	Quasi Peak Limit (dBµV)	Antenna Polarity (H/V)
82.921	28.9	39	V
129.003	37.0	43.5	V
187.399	36.5	43.5	V
211.973	34.4	43.5	V
230.388	35.4	46.4	V
331.774	36.9	46.4	V

Test Method

As per ANSI C63.4 : 1992

Measurements performed at a test distance of 10m.

Frequency Range tested = 30 to 1000MHz (as per sec 15.33 (a)(1)).

Measurement Detector Details: Quasi-Peak, 120 kHz bandwidth.

Note: Initial pre-testing was performed to obtain worst case operating mode for the compliance test (Authorised RF ID card on and off the reader).

Radiated Emissions Test Configuration

EUT Configuration

Radiated Emissions Environmental Conditions

Power Supply (to controller)	120V, 60 Hz
Temperature	10 °C
Relative Humidity	67 %
Barometric Pressure	978 mb

Radiated Emissions Measurement Uncertainties

Frequency	± 200kHz
Amplitude	± 4.6dB

The uncertainties stated are calculated in accordance with the requirements of UKAS with a confidence level of 95%.

Test Equipment Used

Equipment Type	Model Number	Last Calibration Date	Calibration Interval
Biconical Antenna	EMCO 3110	11/11/98	2 Years
Log Periodic Antenna	EMCO 3146	2/6/98	2 Years
Hewlett Packard	HP8573B	12/5/99	1 Year

8.5 AC Power Line Conducted Emissions Test Results

CFR 47 Clause:	15.207
Frequency Range	0.45 – 30 MHz.

Operating Mode

The compliance test was performed with an authorised RF ID card on the reader (door closed condition).

Test Results

Live Terminal Worst Case Emissions

Frequency (MHz)	Quasi Peak Measurement (dBµV)	Quasi Peak Limit (dBµV)
17.5005	45.7	47.96
18.0000	45.2	47.96
18.4995	45.4	47.96
18.9990	45.1	47.96
19.2510	46.8	47.96
19.4985	44.0	47.96

Neutral Terminal Worst Case Emissions

Frequency (MHz)	Quasi Peak Measurement (dBµV)	Quasi Peak Limit (dBµV)
18.4995	44.7	47.96
18.7515	46.0	47.96
18.9990	44.5	47.96
19.2510	46.2	47.96
19.7505	45.8	47.96
20.0025	45.4	47.96

Note: The figures shown have been corrected automatically by measurement software, to account for cable loss and LISN attenuation.

Test Method

As per ANSI C63.4 : 1992.

Measurement Detector Details: Quasi-Peak, 9 kHz bandwidth.

Note: Initial pre-testing was performed to obtain worst case operating mode for the compliance test (Authorised RF ID card on and off the reader) .

Conducted Emissions Test Configuration

EUT Configuration

Conducted Emissions Environmental Conditions

Power Supply (to controller)	120V, 60Hz
Temperature	16.5 °C
Relative Humidity	36 %
Barometric Pressure	1021 mb

Conducted Emissions Measurement Uncertainties

Frequency	± 200kHz
Amplitude	± 3.0dB

The uncertainties stated are calculated in accordance with the requirements of UKAS with a confidence level of 95%.

Test Equipment Used

Equipment Type	Model Number	Last Calibration Date	Calibration Interval
LISN (50Ω)	Thurlby Thandar TTi 1600	7/5/99	1 Year
Chase Receiver	LHR7000	22/2/00	1 Year
Software	Version 6.00b	N/A	N/A
SGS Screened Room	-	N/A	N/A

8.6 Radiated Emissions Test Results- Intentional Radiator

CFR Clause	15.209
Frequency Range	0.15MHz – tenth harmonic frequency

Operating Mode

All measurements performed without card on reader (door closed condition).

Test Results

Worst Case Emissions

Frequency (kHz)	Corrected Peak Measurement (dBµV/m)	Limit (dBµV/m)
*125.033	15.53	25.66
**250	<-33.90	25.66
374.88	-20.4	25.66
625.56	-29.67	25.66
875.04	-33.83	25.66
1125.09	-45.17	25.66
1375.24	-41.83	25.66

*Indicates fundamental (carrier) emission at 115% of controller mains supply voltage (138V), card not on reader.

**Noise floor figures of test equipment shown at approximate fundamental harmonic frequencies.

Test Method

As per ANSI C63.4 : 1992

Measurements performed at 3m and extrapolated to correct distance (300m below 490kHz) using factor of 40dB/dec. Hence the correction factor of –80 dB was used. The corrected values are given above.

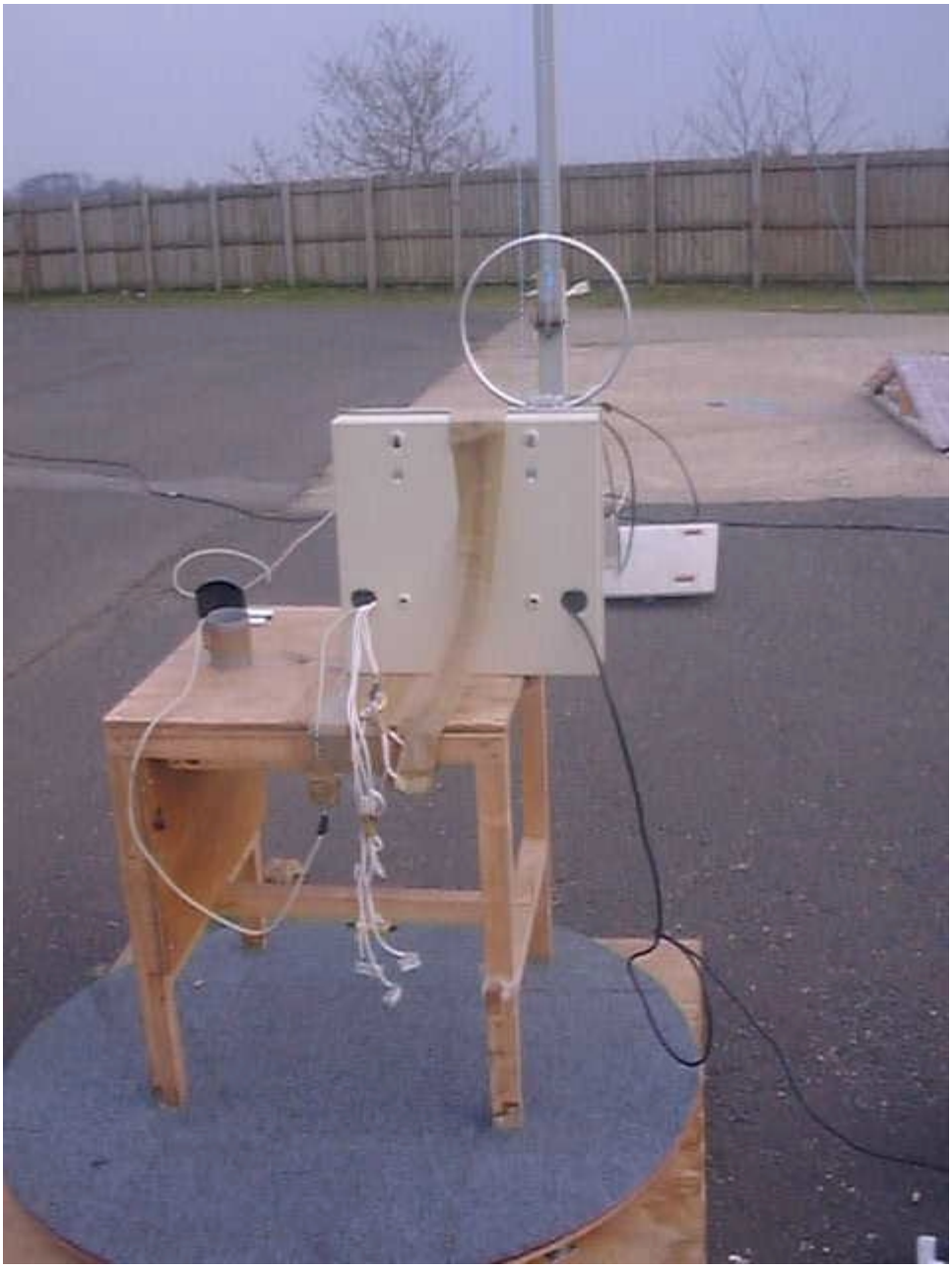
Frequency Range tested = 0.15MHz to tenth harmonic frequency (as per sec 15.33 (a)(1)).

Measurement Detector Details: Peak, 300Hz bandwidth at frequencies below 150 kHz, 10 kHz at frequencies above 150 kHz.

Note: Initial pre-testing was performed to obtain worst case operating mode for the compliance test (Authorised RF ID card on and off the reader).

Radiated Emissions Test Configuration

EUT Configuration



Radiated Emissions Environmental Conditions

Power Supply (to controller)	120V, 60Hz
Temperature	11 °C
Relative Humidity	37 %
Barometric Pressure	972 mb

Radiated Emissions Measurement Uncertainties

Frequency	± 200kHz
Amplitude	± 4.6dB

The uncertainties stated are calculated in accordance with the requirements of UKAS with a confidence level of 95%.

Test Equipment Used

Equipment Type	Model Number	Last Calibration Date	Calibration Interval
Active loop antenna	EMCO 6502	7/8/98	2 Years
Spectrum Analyser	HP 8591E	15/9/99	1 Year

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