SGS United Kingdom Ltd.

International Electrical Approvals

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Electromagnetic Compatibility

Test of:	RF Card Entry System
Model Number:	Refer to page 5
Applicant:	PAC International Ltd
Test Type:	Compliance
Test Specification:	FCC CFR47, parts 15.107, 15.109, 15.207 and 15.209
Test Result:	Complied
SGS Serial Number:	DUR 24095/EMC/LS/02
Date of Receipt:	10th June 2002
Date of Test(s):	10th June 2002 – 20th June 2002
Date of Issue:	9th January 2003
Issue Number:	3

This report refers only to the sample submitted for test.

Test Engineer	***Authorised Signatory***
L.Steel	A. Reynard Technical Manager

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1. Client Information

Company Name:	PAC International Ltd
Address:	1 Park Gate Close, Bredbury, Stockport, SK6 2SZ.
Contact Person:	Shaun Byrne
Telephone:	0161 406 3400
Facsimile:	0161 430 8658

2. Details Of Test Laboratory

Company Name:	SGS International Electrical Approvals
UKAS Accreditation Number:	1116
Address:	South Industrial Estate, Bowburn, Co. Durham, DH6 5AD.
Contact Persons:	Mr Alan Reynard
Telephone:	0191 377 2000
Facsimile:	0191 377 2020

3. Equipment Under Test (EUT)

3.1 Identification Of EUT

Model Number:	Refer to page 5.
Unique Identifier:	Refer to page 5
Description of EUT:	RF Card Entry System
Internal Clock Frequencies:	Refer to page 5.
Supply Voltage: **(To Controller)**	16.5v ac, 12v dc or 15v dc, via adapters (see page 5) NOTE: All other parts of the system obtain their power via the controller.
Classification:	Refer to page 5.
Accessories Supplied:	Refer to page 5.

4. Test Specification, Methods and Procedures

4.1 Test Specification(s)

Specification(s)	Title
FCC CFR 47 : October 1999 Parts 15.107/15.207, 15.109 and 15.209	Code Of Federal Regulations

4.2 Purpose Of Test

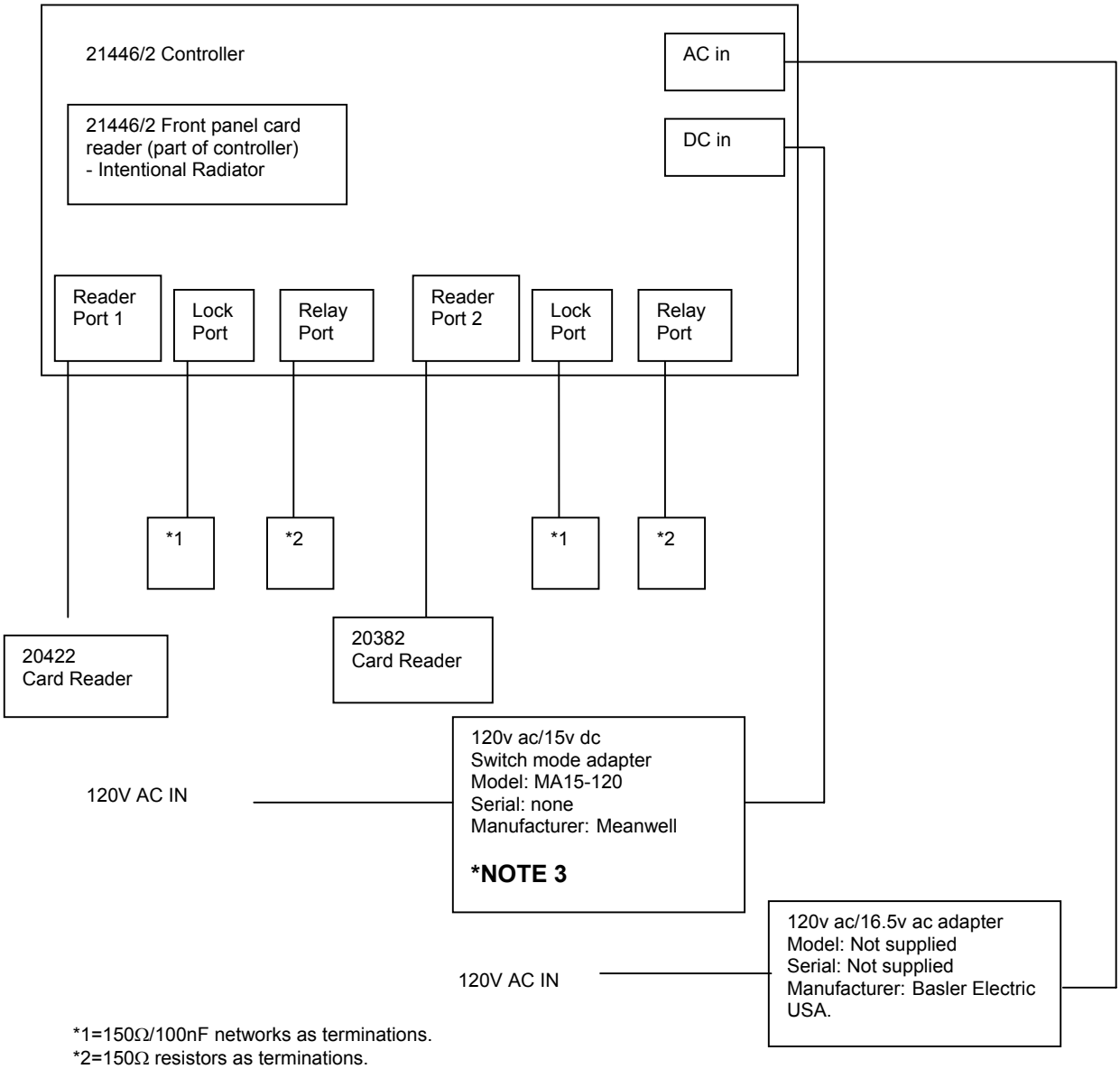
1) To test the whole system to clauses 15.107/15.207 and 15.109
2) To test the 21446/2 front panel card reader only, to the requirements of 15.209 (Up to 30 MHz only).

4.3 Methods and Procedures

The standard listed above refers to the following tests: -

CFR 47 Clause	Test
15.107/15.207	Conducted Emissions (Intentional and Unintentional Radiators)
15.109 (30-1000 MHz)	Radiated Emissions (Intentional and Unintentional Radiators)
15.209 (9 kHz to 30 MHz)	Radiated Emissions (Intentional Radiator)

EUT System Diagram



*1=150Ω/100nF networks as terminations.
*2=150Ω resistors as terminations.

NOTE 1: All interconnecting cables 1m long. Interconnecting cables are signal/low voltage dc.
NOTE 2: Power adapters are not supplied by PAC. They are typical power supplies, supplied in order to perform the conducted emissions tests. Also note that the product operates from one adapter or the other i.e. they are not used simultaneously.
NOTE 3: For testing to 15.107/15.207 a different ac/dc adapter was used to that shown above. The details of the adapter used for the Conducted Emissions are as follows: Manufacturer: Ecopac Power UK Ltd, Model: SA60-12v, Voltage: 12 v dc

Component Model No.	Serial No.	Descsription	Intentional/ Unintentional Radiator?	Highest Frequency Generated/Used
21446/2	None	Controller	Unintentional	12.28 MHz
21446/2	None	Front Panel	Intentional and Unintentional	12.28 MHz
20422	1974357	Card Reader	Intentional and Unintentional	614 kHz
20382	1973947	Card Reader	Intentional and Unintentional	614 kHz

5. Deviations or Exclusions from the Test Specifications

There were no deviations from the test specifications.

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

6.1 Operation of EUT during testing.

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

6.2 Configuration and Peripherals

Refer to page 5 for details.

7. Test Results

7.1 General Comments

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

7.2 Modifications Made to the EUT

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

7.3 Summary of Test Results

CFR 47 Clause	Test	Result
15.107/15.207	Conducted Emissions (Whole EUT system tested)	Complied
15.109	Radiated Emissions (Whole EUT system tested)	Complied
15.209	Radiated Emissions (PAC 21446/2 front panel card reader only)	Complied

Result

i) In the configuration tested, the whole system complies with the requirements of Clauses 15.107/15.207 and 15.109 of CFR 47 : October 1999.

ii) In the configuration tested, the PAC 21446/2 front panel card reader complies with the requirements of Clause 15.209 of CFR 47 : October 1999, across the frequency range 9 kHz to 30 MHz.

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

7.4 Conducted Emissions Test Results – 15.107/15.207

CFR 47 Clause:	15.107/15.207
Limits:	CISPR 22, Class B (As specified in FCC document FCC 02-157 (ET Docket No. 98-80), adopted May 23rd 2002).
Frequency Range	0.15 – 30 MHz.

Operating Mode

The compliance test was performed with authorised cards presented to the controller front panel reader, the 20422 reader and the 20382 reader.

NOTE: Measurements were performed at the AC mains of the controller:

a) whilst operating via the AC/AC Adapter
b) whilst operating via the AC/DC adapter.

Test Method

As per ANSI 63.4 : 1992

Measurement detector details: Quasi-Peak, 9 kHz bandwidth

Test Results

NOTE: The test results shown have automatically been corrected to account for LISN attenuation and cable loss, via measurement software.

Test Results

a) whilst operating via the AC/AC Adapter

Live Terminal Worst Case Emissions

Frequency (MHz)	Quasi Peak Measurement (dBμV)	Quasi Peak Limit (dBμV)	Average Measurement (dBμV)	Average Limit (dBμV)
0.168	55.4	65.1	25.7	55.1
0.195	53.99	63.8	25.2	53.8
0.249	50.78	61.8	22.38	51.8
0.276	48.46	60.9	19.56	50.9
0.294	46.55	60.4	19.55	50.4
0.312	44.75	59.9	19.55	49.9

Neutral Terminal Worst Case Emissions

Frequency (MHz)	Quasi Peak Measurement (dBμV)	Quasi Peak Limit (dBμV)	Average Measurement (dBμV)	Average Limit (dBμV)
0.150	55.15	66	26.45	56
0.168	55.44	65.1	25.64	55.1
0.195	54.03	63.8	24.43	53.8
0.204	53.43	63.4	24.43	53.4
0.258	50.3	61.5	21.4	51.5
0.294	46.79	60.4	19.59	50.4

b) whilst operating via the AC/DC Adapter

Live Terminal Worst Case Emissions

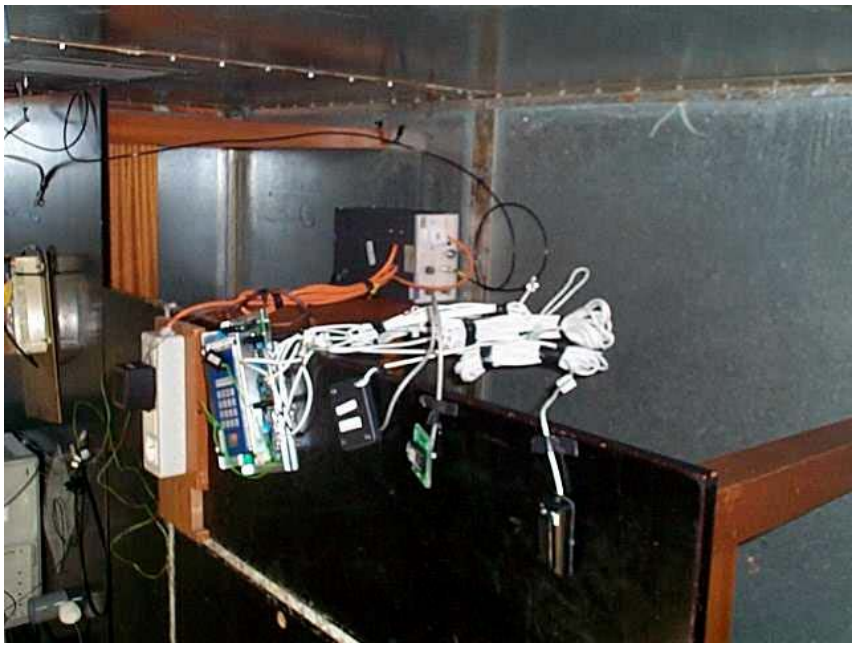
Frequency (MHz)	Quasi Peak Measurement (dBμV)	Quasi Peak Limit (dBμV)	Average Limit (dBμV)
0.177	42.34	64.63	54.63
0.240	44.01	62.1	52.1
0.303	29.48	60.16	50.16
1.203	35.49	56	46
1.626	35.48	56	46
11.922	28.67	60	50

NOTE: Average measurements not performed since Quasi-Peak measurements are below the Average limit.

Neutral Terminal Worst Case Emissions

Frequency (MHz)	Quasi Peak Measurement (dBμV)	Quasi Peak Limit (dBμV)	Average Measurement (dBμV)	Average Limit (dBμV)
0.184	45.37	64.3	43.47	54.3
0.246	44.77	61.9	44.17	51.9
0.426	40.7	57.3	40.5	47.3
1.07	34.47	56	31.67	46
15.5	31.85	60	28.85	50
28.91	17.68	60	9.18	50

Conducted Emissions Test Configuration



Conducted Emissions Environmental Conditions

Power Supply (to controller)	120V, 60Hz
Temperature	19.5°C
Relative Humidity	43%
Barometric Pressure	994mb

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
LISN (50Ω)	Thurlby Thandar TTi 1600	Jan 02
Chase Receiver	LHR7000	Sep 01
SGS Screened Room	-	-
Spectrum Analyser	HP8563E	Nov 00
Check Equip.	PLC 1C	-

7.5 Radiated Emissions Test Results – 15.109

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

Operating Mode

The compliance test was performed with authorised cards presented to the controller front panel reader, the 20422 reader and the 20382 reader.

NOTE: The EUT was tested whilst powered by the AC/AC adapter.

Test Results

Worst Case Emissions

Frequency MHz	Quasi-Peak Measurement @10m (dBμV/m)	Quasi-Peak Limit @10m (dBμV/m)	Antenna Polarity
66.342	20.34	39	Vertical
71.255	21.94	39	Vertical
81.125	26.64	39	Vertical
83.987	31.64	39	Vertical
86.004	33.04	39	Vertical
125.327	30.14	43.5	Vertical
130.243	32.14	43.5	Vertical
135.155	31.84	43.5	Vertical
140.100	32.34	43.5	Vertical
245.792	22.24	46.4	Vertical

NOTE 1: The test results shown have automatically been corrected to account for Antenna factors, pre-amplifier gain and cable losses, via measurement software.

NOTE 2: Vertical antenna polarity was worst case for all emissions, hence results for horizontal antenna polarity were not recorded.

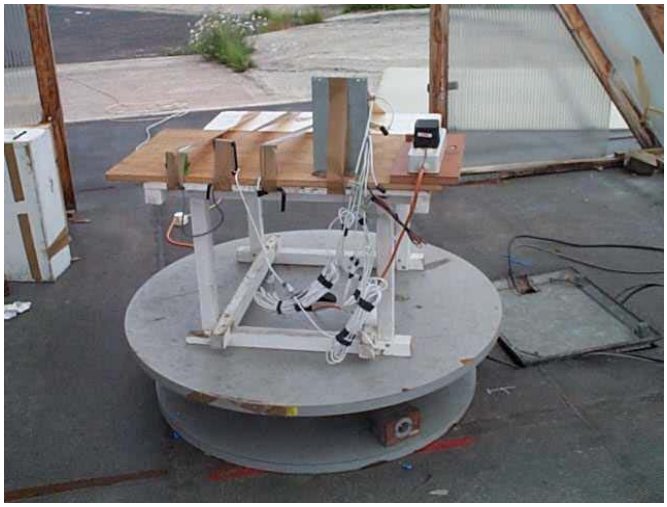
Test Method

As per ANSI 63.4 : 1992

Measurements performed at a test distance of 3m and extrapolated to an equivalent 10m value, by deducting an extrapolation factor of 20dB per decade.

Measurement detector details: Quasi-Peak, 120 kHz bandwidth

Radiated Emissions Test Configuration



Radiated Emissions Environmental Conditions

Power Supply (to controller)	120V AC, 60 Hz
Temperature	12°C
Relative Humidity	67%
Barometric Pressure	998mb

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
Receiver System	HP 8573B	Nov 01
Biconical Antenna	EMCO 3110	Nov 00
Log Periodic Antenna	EMCO 3146	Aug 01
Pre-amplifier	ZHL 1042J	Jan 02
Check Equip.	York CNE III	-
Software	Open Site HP85879	-

7.6 Radiated Emissions Test Results – 15.209

CFR Clause	15.209
Frequency Range	9 kHz to 30 MHz

Operating Mode

The compliance test was performed with an authorised card presented to the controller front panel reader.

Test Results

Peak Measurements

Frequency MHz	Corrected Peak Measurement (dBμV/m)	Limit (dBμV/m)
*0.154	-22.94	23.87
0.041	-33.97	-22.94
0.123	-44.82	-22.94
[1]0.250	-53.98	-22.94
[1]0.550	-54.08	-22.94
[1]0.700	-54.08	-22.94
[1]0.850	-54.08	-22.94
[1]0.900	-54.08	-22.94

*Indicates EUT carrier frequency. The supply voltage to the controller was varied between 85% and 115% to maximise the carrier level.
[1]Indicates typical noise floor figures of test equipment.

Note: Limit for spurious emissions is the measured level at the fundamental frequency, as per sec 15.209c.

Test Method

As per ANSI 63.4 : 1992

Measurements performed at a test distance of 1m and extrapolated to correct distance of 300m, using a factor of 40 dB/decade, hence a correction factor of –99.08 was used. The corrected levels are shown above.

Measurement detector details: Peak Detector, 300 Hz bandwidth where F=<150kHz, 10 kHz bandwidth where F=>150 kHz

Radiated Emissions Test Configuration

Radiated Emissions Environmental Conditions

Power Supply (to controller)	120V AC, 60 Hz
Temperature	13°C
Relative Humidity	59%
Barometric Pressure	976mb

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
Loop Antenna	EMCO 6502	Dec 00
Spectrum Analyser	HP8563E	Nov 00