**SGS United Kingdom Ltd.**

**International Electrical Approvals**

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# *Electromagnetic Compatibility*

| | |
|---|---|
| **Test of:** | Central Network Controller (CNC), including power supply |
| **Model Number:** | 25396 (Central Network Controller), Model no. not supplied for Power Supply |
| **Applicant:** | PAC International Ltd |
| **Test Type:** | Compliance |
| **Test Specification:** | FCC CFR47, parts 15.107/15.207, 15.109 and 15.209. |
| **Test Result:** | Complied |
| **SGS Serial Number:** | DUR 24097/EMC/LS/02 |
| **Date of Receipt:** | 20th May 2002 |
| **Date of Test(s):** | 27th May 2002 – 29th May 2002 |
| **Date of Issue:** | 10th January 2003 |
| **Issue Number:** | 3 |

*This report refers only to the sample submitted for test.*



| *Test Engineer* | *Authorised Signatory* |
|---|---|
| L.Steel | A. Reynard<br>Technical Manager |

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**Page Number**

## 1. Client Information

| | |
|---|---|
| **Company Name:** | PAC International Ltd |
| **Address**: | 1 Park Gate Close,<br>Bredbury,<br>Stockport,<br>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,<br>Bowburn,<br>Co. Durham,<br>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:** | 25396 (Central Network Controller / CNC),<br>Model no. not supplied for Power Supply |
| **Unique Identifier:** | Unique identifier not supplied for CNC,<br>1984493 (Power Supply) |
| **Description of EUT:** | Central Network Controller, including Power Supply |
| **Internal Clock Frequencies:**<br>**(Maximum)** | 32 MHz – CNC<br><108 MHz (Power Supply) |
| **Supply Voltage:** | 120v ac, 60 Hz |
| **Classification:** | Intentional and Unintentional Radiator (CNC),<br>Unintentional Radiator (Power Supply) |
| **Accessories Supplied:** | None |

# 4. Test Specification, Methods and Procedures

## 4.1 Test Specification(s)

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

## 4.2 Purpose Of Test

To perform the relevant tests and assess the product for compliance with the above specification.

## 4.3 Methods and Procedures

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

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

## 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

The central network controller (cnc) connects to the power supply via a low voltage dc cable. During tests, this cable was bundled to 1m in length.

The controller has the following additional ports, terminated as indicated:

i) 5 signal ports, terminated with various resistors at the end of 1m lengths of cable
ii) 1 reader port, with 1m cable attached to it (lead unterminated)

The power supply has a battery backup port – this was terminated with a typical battery via a 1m lead.

Note: terminations as provided by client.

# 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 | Complied |
| 15.109 | Radiated Emissions<br>30-1000 MHz<br>(Intentional and Unintentional Radiator) | Complied |
| 15.209 | Radiated Emissions<br>9 kHz to 30 MHz<br>(Intentional Radiator) | Complied |

**Result**

In the configuration tested, the EUT complies with the test standard detailed above.

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

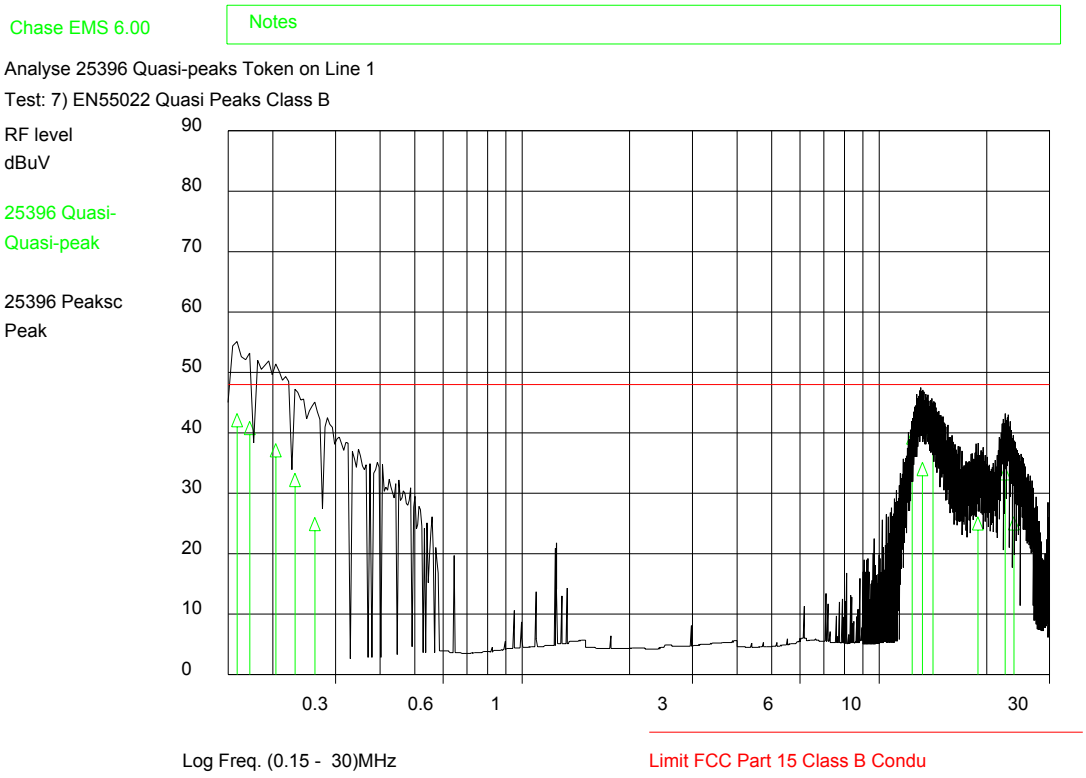
| | |
|---|---|
| **CFR 47 Clause:** | 15.107/15.207 |
| **Limits:** | CISPR 22, Class B<br>(As specified in FCC document FCC 02-157 (ET Docket No. 98-80), adopted May 23rd 2002). |
| **Frequency Range** | 0.15 – 30 MHz |

**Operating Mode**

The compliance test was performed whilst the central network controller had an authorised card presented to its reader.

## Test Results

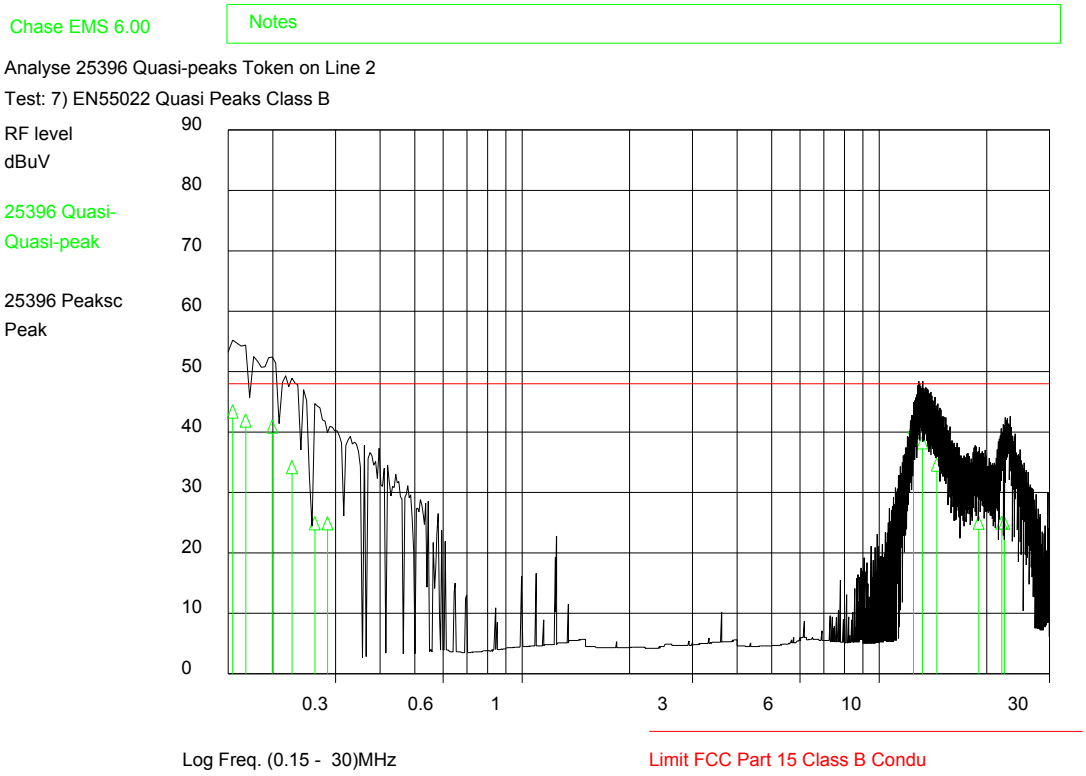
### Live Terminal Worst Case Emissions




| Frequency (MHz) | Quasi Peak Measurement (dBμV) | Quasi Peak Limit (dBμV) | Average Limit (dBμV) |
|---|---|---|---|
| 0.1590 | 43.2 | 65.5 | 55.5 |
| 0.1725 | 41.9 | 64.8 | 54.8 |
| 0.2040 | 38.2 | 63.4 | 53.4 |
| 0.2310 | 33.3 | 62.4 | 52.4 |
| 0.2625 | 26.0 | 61.3 | 51.3 |
| 12.3765 | 40.3 | 60 | 50 |
| 13.2270 | 35.1 | 60 | 50 |
| 14.1585 | 41.7 | 60 | 50 |
| 18.9150 | 26.1 | 60 | 50 |
| 22.5285 | 34.4 | 60 | 50 |
| 23.8695 | 26.1 | 60 | 50 |

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

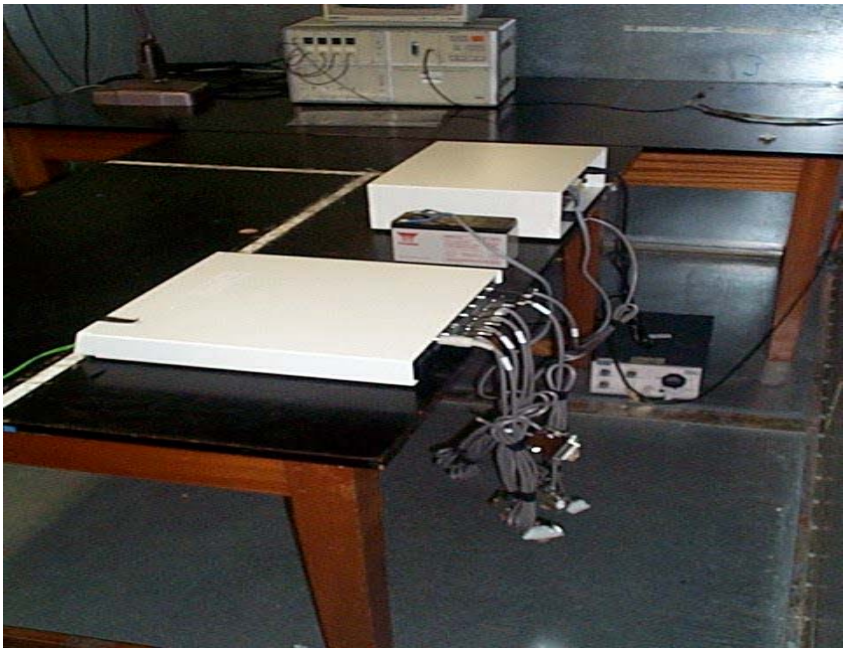
### *Neutral Terminal Worst Case Emissions*




| Frequency (MHz) | Quasi Peak Measurement (dBμV) | Quasi Peak Limit (dBμV) | Average Limit (dBμV) |
|---|---|---|---|
| 0.1545 | 44.5 | 65.8 | 55.8 |
| 0.1680 | 43.0 | 65.1 | 55.1 |
| 0.1995 | 42.0 | 63.6 | 53.6 |
| 0.2265 | 35.3 | 62.6 | 52.6 |
| 0.2625 | 26.0 | 61.3 | 51.3 |
| 0.2850 | 26.0 | 60.7 | 50.7 |
| 12.4755 | 41.9 | 60 | 50 |
| 13.2225 | 39.4 | 60 | 50 |
| 14.5095 | 35.7 | 60 | 50 |
| 19.0140 | 26.1 | 60 | 50 |
| 22.0560 | 26.1 | 60 | 50 |
| 22.4250 | 26.1 | 60 | 50 |

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

**Conducted Emissions Test Configuration**



**Conducted Emissions Environmental Conditions**

| | |
|---|---|
| **Power Supply (to controller)** | 120V, 60Hz |
| **Temperature** | 19.5°C |
| **Relative Humidity** | 52% |
| **Barometric Pressure** | 1000mb |

**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 |
| Software | Version 6.00b | - |
| 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 whilst the central network controller had an authorised card presented to its reader.

**Test Results**

| Frequency (MHz) | Quasi-Peak Measurement @10m (dBμV/m) | Quasi-Peak Limit @10m (dBμV/m) | Antenna Polarity |
|---|---|---|---|
| 63.986 | 13.44 | 39.0 | Vertical |
| 79.974 | 7.74 | 39.0 | Vertical |
| 110.681 | 18.44 | 43.5 | Vertical |
| 141.435 | 17.54 | 43.5 | Vertical |
| 191.988 | 15.44 | 43.5 | Vertical |
| 213.576 | 18.34 | 43.5 | Vertical |
| 239.978 | 21.54 | 46.4 | Vertical |
| 383.984 | 37.74 | 46.4 | Vertical |

[1]Indicates typical noise floor figures of test equipment.

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.

NOTE 3: Measurements were performed at a test distance of 3m and extrapolated to an equivalent 10 m value by deducting an extrapolation factor of 20 dB decade, hence a correction factor of -10.46dB was used.

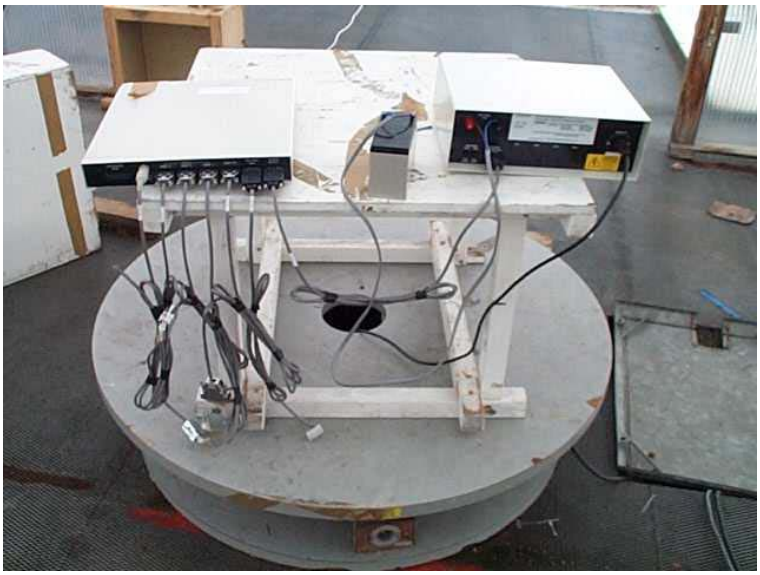
**Test Method**

As per ANSI 63.4 : 1992

Measurements performed at a test distance of 3m.

Measurement detector details: Quasi-Peak, 120 kHz bandwidth

**Radiated Emissions Test Configuration**



**Radiated Emissions Environmental Conditions**

| | |
|---|---|
| **Power Supply (to controller)** | 120V AC, 60Hz |
| **Temperature** | 9°C |
| **Relative Humidity** | 67% |
| **Barometric Pressure** | 986mb |

**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 whilst the central network controller had an authorised card presented to its reader.

**Test Results**

***Peak Measurements***

| Frequency MHz | Corrected Peak Measurement** (dBμV/m) | Limit (dBμV/m) | Measurement Distance (metres) |
|---|---|---|---|
| *0.125 | -26.38 | 25.66 | 300 |
| 0.050 | -14.31 | n/a* | 300 |
| 0.993 | 11.39 | 27.66 | 30 |
| 0.149 | -42.21 | 24.14 | 300 |
| 0.248 | -49.15 | 19.71 | 300 |
| 0.298 | -48.84 | 18.11 | 300 |
| 0.348 | -48.81 | 16.77 | 300 |
| 0.375 | -35.65 | 16.12 | 300 |
| 0.447 | -53.31 | 14.59 | 300 |
| 1.125 | -12.58 | 26.58 | 30 |

*n/a: Emission found to be generated by the power supply unit (an unintentional device) which is not subject to the Intentional radiator limits.

*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.

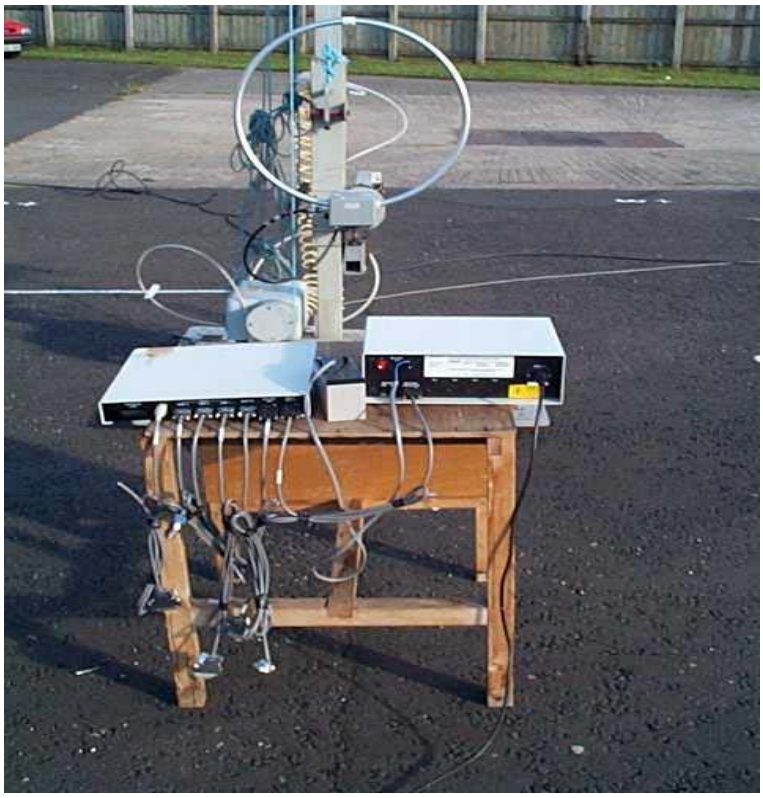
**Test Method**

As per ANSI 63.4 : 1992

** Measurements performed at a test distance of 1m and extrapolated to correct distance of 300m and 30m respectively using a factor of 40 dB/decade. Hence a correction factor of –99.08 for 300m and –59.08 for 30m 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, 60Hz |
| **Temperature** | 9.5°C |
| **Relative Humidity** | 63% |
| **Barometric Pressure** | 982mb |

**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 |