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FCC PART 87 TEST REPORT

| | |
|-----------------------------|--|
| APPLICANT | ROCKWELL COLLINS |
| | AIR TRANSPORT SYSTEMS |
| | 1300 WILSON BLVD. SUITE 200 |
| | ARLINGTON VA 22209 USA |
| FCC ID | AJKPN822-2763 |
| MODEL NUMBER | VHF-2200 |
| PRODUCT DESCRIPTION | VHF TRANSCEIVER |
| DATE SAMPLE RECEIVED | 6/16/2011 |
| DATE TESTED | 7/26/2011 |
| TESTED BY | Joe Scoglio |
| APPROVED BY | Mario R. de Aranzeta |
| TIMCO REPORT NO. | 1323AT11TestReport.doc |
| TEST RESULTS | <input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL |

**THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL
WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.**



Certificate # 0955-01

TABLE OF CONTENTS

| | |
|---|----|
| STATEMENT OF COMPLIANCE..... | 3 |
| GENERAL INFORMATION | 4 |
| EMC EQUIPMENT LIST | 6 |
| TEST PROCEDURES | 7 |
| RF POWER OUTPUT | 8 |
| MODULATION CHARACTERISTICS..... | 9 |
| VOICE MODULATED COMMUNICATION EQUIPMENT | 10 |
| FIELD STRENGTH OF SPURIOUS EMISSIONS..... | 16 |
| FREQUENCY STABILITY..... | 17 |

STATEMENT OF COMPLIANCE

This equipment has been tested in accordance with the standards identified in the referenced test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report and demonstrate that the equipment complies with the appropriate standards. No modifications were made to the equipment during testing in order to demonstrate compliance with these standards.

I attest that the necessary measurements were made by me or under my supervision, at Timco Engineering, Inc. located at 849 N.W. State Road 45, Newberry, Florida 32669 USA.

Authorized by: Mario R. de Aranzeta



Signature:

Function: Lab Supervisor/Engineer

Date: 7/29/11

GENERAL INFORMATION

DUT Specification

| | |
|---|---|
| The test results relate only to the items tested. | |
| DUT Description | VHF TRANSCEIVER |
| FCC ID | AJKPN822-2763 |
| Model Number | VHF-2200 |
| Operating Frequency | 118-136 |
| | |
| Type of Emission | 5K0A3E, 10K0A3D, 14K0G1D, 14K0G1E |
| Modulation | DSB voice and data, D8PSK data |
| DUT Power Source | <input type="checkbox"/> 110-120Vac/50- 60Hz |
| | <input checked="" type="checkbox"/> DC Power 28 Vdc |
| | <input type="checkbox"/> Battery Operated Exclusively |
| Test Item | <input type="checkbox"/> Prototype |
| | <input type="checkbox"/> Pre-Production |
| | <input checked="" type="checkbox"/> Production |
| Type of Equipment | <input type="checkbox"/> Fixed |
| | <input checked="" type="checkbox"/> Mobile |
| | <input type="checkbox"/> Portable |

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FCC ID: AJKPN822-2763

Report: R\ROCKWELL_AJK\1323AT11\1323AT11TestReport.doc



Test Facility: The test sites used by Timco Engineering Inc. for collecting radiated and conducted emission data are located at 849 NW State Road 45 Newberry, FL 32669 USA.

Test Condition: The DUT was tested in the laboratory in an environment with normal temperature and humidity. The temperature was 26°C with a relative humidity of 50%.

Modification to the DUT: No modification was made to the DUT during testing.

Test Exercise (e.g software description, test signal, etc.): The DUT was placed in continuous transmit mode of operation.

Applicable Standards: ANSI/TIA 603-C: 2004
FCC CFR 47 Part 87

8 level DPSK or D8PSK (14K0G1D & 14K0G1E))

AM Double Sideband (5K0A3E), (10K0A3D)

Part 2.1033(c) (4) Type of Emission:

The authorized bandwidth is kHz.

Part 2.1033(c)(8) DC Voltages and Current into Final Amplifier:
POWER INPUT:

FINAL AMPLIFIER ONLY

INPUT POWER – HIGH: (28 Vdc)(6.6A) = 184.8 Watts

EMC EQUIPMENT LIST

| Device | Manufacturer | Model | Serial Number | Cal/Char Date | Due Date |
|---------------------------------------|--------------------|---------------|--------------------------|-------------------|-----------|
| 3-Meter Semi-Anechoic Chamber | Panashield | N/A | N/A | Listed 5/10/10 | 5/10/12 |
| AC Voltmeter | HP | 400FL | 2213A14499 | CAL 6/12/11 | 6/12/13 |
| Antenna: Active Loop | ETS-Lindgren | 6502 | 00062529 | CAL 9/23/10 | 9/23/12 |
| Antenna: Passive Loop | EMC Test Systems | EMCO 6512 | 9706-1211 | CAL. 9/1/09 | 9/2/11 |
| Frequency Counter | HP | 5385A | 2730A03025 | CAL 8/17/11 | 8/17/13 |
| Hygro-Thermometer | Extech | 445703 | 0602 | CAL 6/15/11 | 6/15/13 |
| Modulation Analyzer | HP | 8901A | 3435A06868 | CAL 7/18/11 | 7/18/13 |
| Digital Multimeter | Fluke | FLUKE-77 | 35053830 | CAL 11/18/09 | 11/18/11 |
| Analyzer Tan Tower Preamplifier | HP | 8449B-H02 | 3008A00372 | CAL 11/21/09 | 11/21/11 |
| Analyzer Tan Tower Quasi-Peak Adapter | HP | 85650A | 3303A01690 | CAL 11/22/09 | 11/22/11 |
| Analyzer Tan Tower RF Preselector | HP | 85685A | 3221A01400 | CAL 11/21/09 | 11/21/11 |
| Analyzer Tan Tower Spectrum Analyzer | HP | 8566B Opt 462 | 3138A07786 3144A20661 | CAL 11/24/09 | 11/24/11 |
| Temperature Chamber | Tenney Engineering | TTRC | 11717-7 | CHAR 4/25/10 | 4/25/12 |
| Antenna | ETS | 3117 | 41534 | 9/22/2010 | 9/22/2012 |
| Antenna | Electro metrics | LPA-25 | 1122 | 5/04/2011 | 5/04/2013 |
| Antenna | Electro metrics | BIA-25 | 1171 | 1/15/2010 | 1/15/2012 |

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FCC ID: AJKPN822-2763

Report: R\ROCKWELL_AJK\1323AT11\1323AT11TestReport.doc

TEST PROCEDURES

Power Line Conducted Interference: The procedure used was ANSI/TIA 603-C: 2005 using a 50uH LISN. Both lines were observed with the DUT transmitting. The bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed.

Bandwidth 20 dB: The measurements were made with the spectrum analyzer's resolution bandwidth (RBW) = 1 MHz and the video bandwidth (VBW) = 3 MHz and the span set as shown on plot.

Power Output: The RF power output was measured at the antenna feed point using a peak power meter.

Antenna Conducted Emissions: The RBW = 100 kHz, VBW = 300 kHz and the span set to 10 MHz and the spectrum was scanned from 30 MHz to the 10th Harmonic of the fundamental. Above 1 GHz the resolution bandwidth was 1 MHz and the VBW = 3 MHz and the span to 50 MHz.

Radiation Interference: The test procedure used was ANSI C63.4-2003 using an Agilent spectrum receiver with pre-selector. The bandwidth (RBW) of the spectrum receiver was 100 kHz up to 1 GHz and 1 MHz above 1 GHz with an appropriate sweep speed. The VBW above 1 GHz was 3 MHz. The analyzer was calibrated in dB above a microvolt at the output of the antenna.

RF POWER OUTPUT

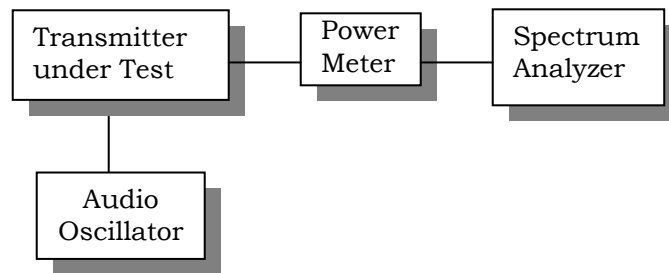
Rule Part No.: Part 2.1046(a), Part 87.131

Test Requirements:

Method of Measurement: RF power is measured by connecting a 50-ohm, resistive wattmeter to the RF output connector. With a nominal battery voltage, and the transmitter properly adjusted the RF output measures:

For the Device has a fixed antenna, RF power is measured as ERP as the antenna is permanently attached. The substitution method was used. With a nominal battery voltage, and the transmitter properly adjusted the RF output measures:

Test Setup Diagram:



Test Data:

OUTPUT POWER:

AM modulation

| | | |
|---------|--|------------|
| 118 MHz | | 29.9 Watts |
| 127 MHz | | 29.4 Watts |
| 136MHz | | 29.9 Watts |

Phase modulation

| | | |
|---------|--|------------|
| 118 MHz | | 21.4 Watts |
| 127 MHz | | 21.9 Watts |
| 136MHz | | 21.9 Watts |

Applicant: ROCKWELL COLLINS

FCC ID: AJKPN822-2763

Report: R\ROCKWELL_AJK\1323AT11\1323AT11TestReport.doc

MODULATION CHARACTERISTICS

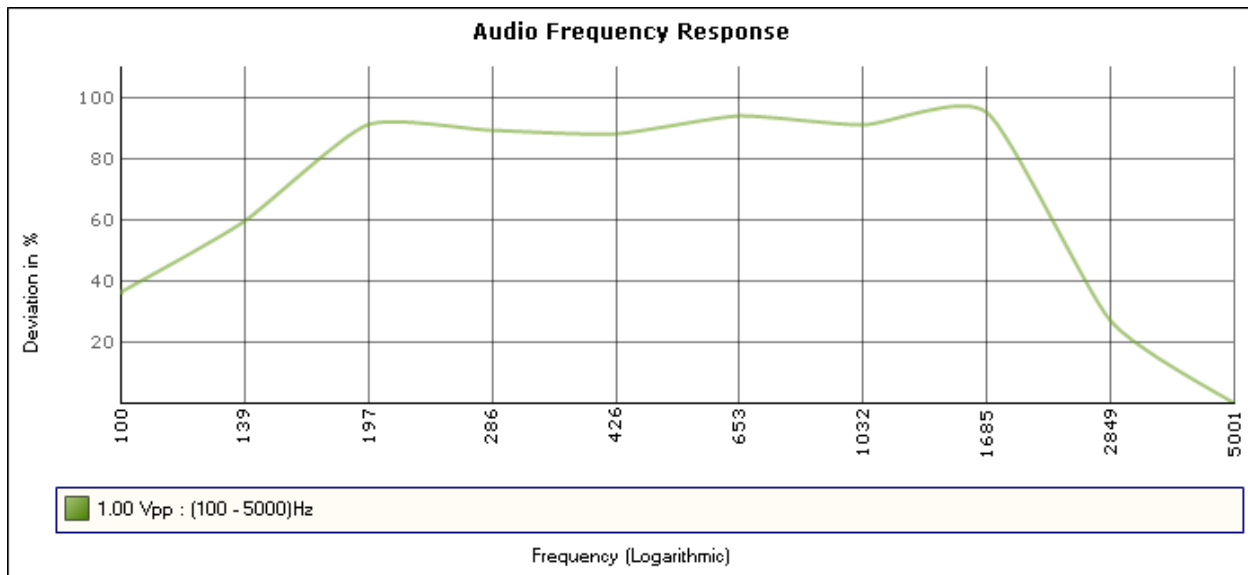
Rule Part No.: Part 2.1047(a)(b)

Test Requirements:

Method of Measurement:

Audio frequency response

The audio frequency response was measured in accordance with ANSI/TIA 603-C: 2004 with the exception that for an AM modulated transmitter the input was varied. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 – 5000Hz. The audio frequency response curve is shown below.



Applicant: ROCKWELL COLLINS

FCC ID: AJKPN822-2763

Report: R\ROCKWELL_AJK\1323AT11\1323AT11TestReport.doc

VOICE MODULATED COMMUNICATION EQUIPMENT

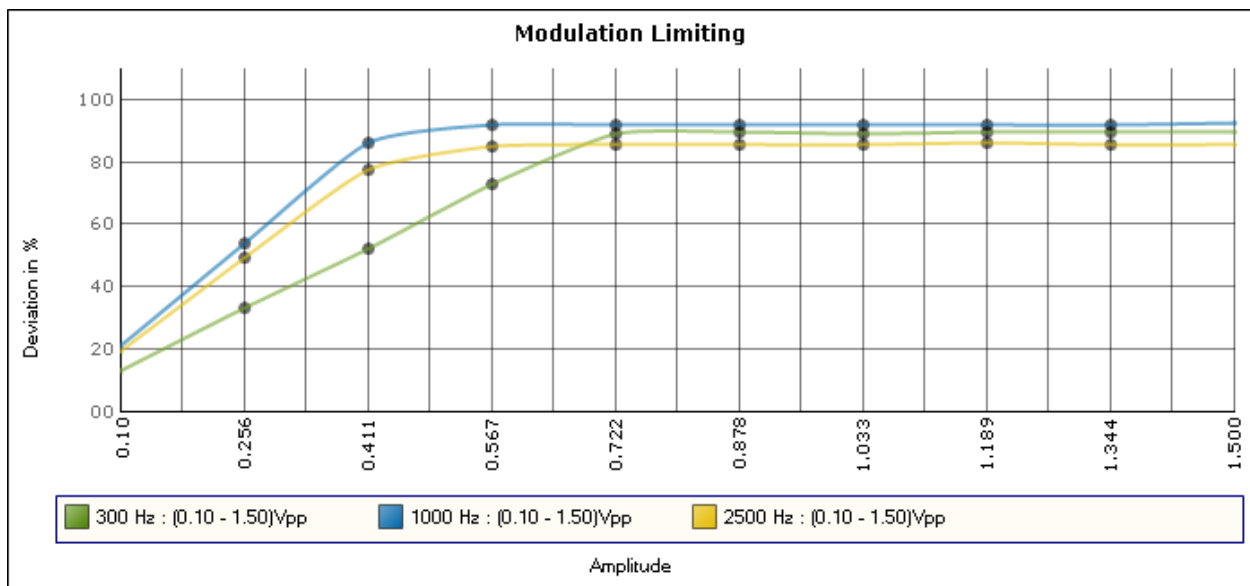
AUDIO INPUT VERSUS MODULATION

Rule Part No.: Part 2.1047(b) & 87.141

Test Requirements:

Method of Measurement: Modulation cannot exceed 100%, The audio input level needed for a particular percentage of modulation was measured in accordance with ANSI/TIA 603-C: 2004. The audio input curves versus modulation are shown below. Curves are provided for audio input frequencies of 300, 1000, and 2500 Hz.

Test data: Please see the plots below





AUDIO LOW PASS FILTER

Rule Part No.: Part 2.1047(a), Part 87.141(F)

Test Requirements:

Method of Measurement:

Test Data: Not applicable. This rule part is only required for FM modulation.

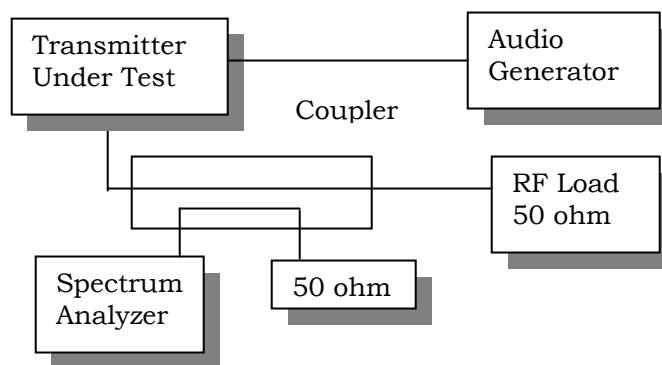
OCCUPIED BANDWIDTH

Rule Part No.: Part 2.1049, Part 87.139

Test Requirements: Data in the plots show that on any frequency removed from the assigned frequency by more than 250% of the authorized bandwidth: At least $43 + 10\log(P)$ dB.

Method of Measurement:

Test Setup Diagram:

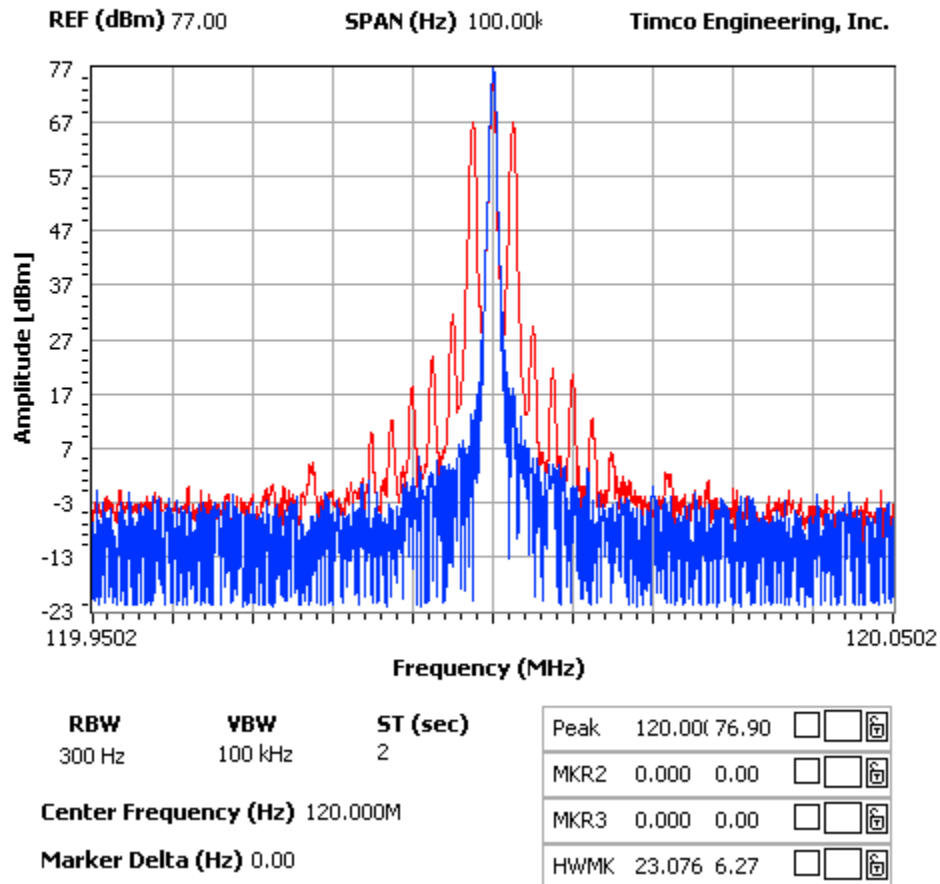


Test Data: See the plots below

The authorized BW is 25 kHz.

Analog modulation

NOTES:



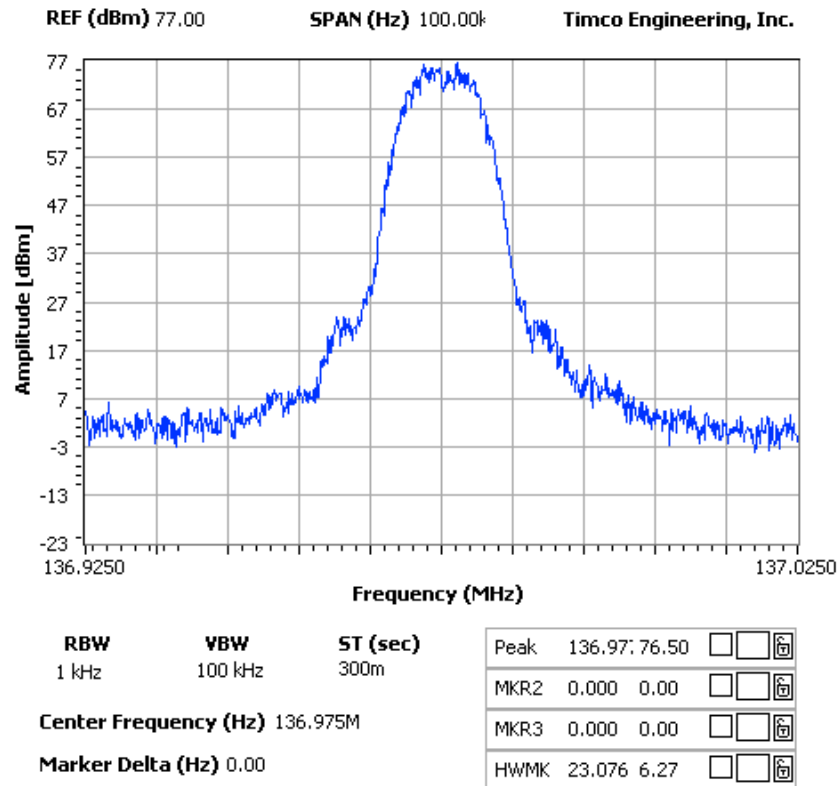
Applicant: ROCKWELL COLLINS

FCC ID: AJKPN822-2763

Report: R\ROCKWELL_AJK\1323AT11\1323AT11TestReport.doc

Digital modulation

NOTES:



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FCC ID: AJKPN822-2763

Report: R\ROCKWELL_AJK\1323AT11\1323AT11TestReport.doc

SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

Rule Part No.: Part 2.1051(a)

Requirements: $43+10\log(pY)= 55 \text{ dB}$

Method of Measurement: The carrier was modulated 100% using a 2500 Hz tone. The spectrum was scanned from 0.4 to at least the 10th harmonic of the fundamental. The measurements were made in accordance with standard TIA/EIA-603.

Test Data:

| Frequency MHz | dBc | | Frequency MHz | dBc | | Frequency MHz | dBc |
|------------------|-------|--|------------------|-------|--|------------------|-------|
| 118 | 0 | | 127 | 0 | | 136 | 0 |
| 236 | 105.3 | | 254 | 104.6 | | 272 | 110.6 |
| 354 | 105.4 | | 381 | 107.1 | | 408 | 109.7 |

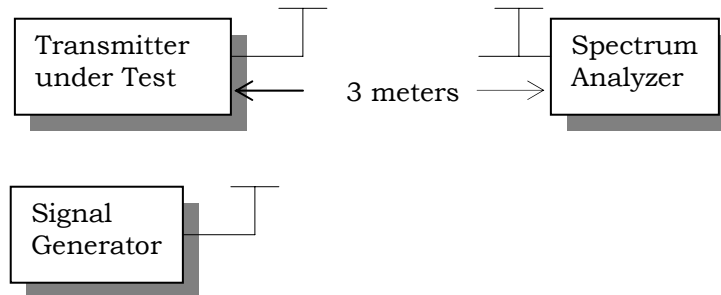
FIELD STRENGTH OF SPURIOUS EMISSIONS

Rule Parts. No.: Part 2.1053

Test Requirements: The FCC limits for radiated emissions are the same as previously stated for the conducted emissions.

Method of Measurements: The spectrum was scanned from 30 MHz to at least the tenth harmonic of the fundamental. This test was conducted per ANSI/TIA 603-C: 2004 using the substitution method.

Test Setup Diagram:



Test Data:

| Tuned Frequency MHz | Emission Frequency MHz | Meter Reading dB μ V | Ant. Pol | Coax Loss dB | Correction Factor dB/m | Field Strength dB μ V/m |
|---------------------|------------------------|--------------------------|----------|--------------|------------------------|-----------------------------|
| 118.1 | 236.20 | 3.7 | H | 0.97 | 11.97 | 16.64 |
| 118.1 | 236.20 | 4.0 | V | 0.97 | 11.97 | 16.94 |
| 118.1 | 354.30 | 13.6 | H | 1.15 | 15.04 | 29.79 |
| 118.1 | 354.30 | 14.0 | V | 1.15 | 15.04 | 30.19 |
| 127.0 | 254.00 | 4.8 | H | 1.01 | 13.14 | 18.95 |
| 127.0 | 254.00 | 7.2 | V | 1.01 | 13.14 | 21.35 |
| 127.0 | 381.00 | 3.0 | H | 1.18 | 15.65 | 19.83 |
| 127.0 | 381.00 | 3.3 | V | 1.18 | 15.65 | 20.13 |
| 135.9 | 271.80 | 10.2 | H | 1.04 | 14.43 | 25.67 |
| 135.9 | 271.80 | 11.1 | V | 1.04 | 14.43 | 26.57 |
| 135.9 | 407.70 | 3.1 | H | 1.21 | 16.22 | 20.53 |
| 135.9 | 407.70 | 3.6 | V | 1.21 | 16.22 | 21.03 |

FREQUENCY STABILITY

Rule Parts. No.: Part 2.1055, Part 87.133

Requirements: Temperature range requirements: -30 to +50° C.
Voltage Variation +, -15% ±20 PPM

Method of Measurements: ANSI/TIA 603-C: 2004

Test Data:

| Assigned Frequency (Ref. Frequency) (MHz) | | 127.000006 |
|---|-----------------|---------------------------|
| Temperature (°C) | Frequency (MHz) | Frequency Stability (PPM) |
| -30 | 127.000084 | 0.61 |
| -20 | 127.000076 | 0.55 |
| -10 | 127.000088 | 0.65 |
| 0 | 127.000102 | 0.76 |
| +10 | 127.000072 | 0.52 |
| +20 | 127.000046 | 0.31 |
| +30 | 126.999992 | -0.11 |
| +40 | 127.000079 | 0.57 |
| +50 | 127.000153 | 1.16 |

| Assigned Frequency (Ref. Frequency) (MHz) | | 127.000006 |
|---|-----------------|---------------------------|
| % Battery (%) | Frequency (MHz) | Frequency Stability (PPM) |
| -15% | 127.000006 | 0.0 |
| | 127.000102 | 0.0 |
| +15% | 127.000006 | 0.0 |

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FCC ID: AJKPN822-2763

Report: R\ROCKWELL_AJK\1323AT11\1323AT11TestReport.doc