CARDINAL COMPONENTS, INC.

SERIES CPP

FIELD PROGRAMMABLE OSCILLATOR

QUALIFICATION

REPORT

PREP. BY RZ	**CARDINAL COMPONENTS, INC.** **155 ROUTE 46 WEST** **WAYNE, N.J. 07470**		
ENGINEERING DJB			
QUALITY ASSURANCE UP	DWG. NO. QR12856		REV.
PRODUCTION			
	SIZE A	SCALE	SHEET 1 OF 26

TABLE OF CONTENTS

1.0 SCOPE

1.1 This document is a detail qualification report for Cardinal Components, Inc. Oscillator Part Series CPP outlining the tests performed, a summary of the test results, and actual test data.

2.0 APPLICABLE DOCUMENTS

2.1 Unless otherwise specified, the following documents of the issue in effect at the date of the testing form a part of this report to the extent specified herein.

SPECIFICATIONS

MIL-O-55310	General Specification for Crystal Oscillators
MIL-STD-202	Test Methods for Electronic and Electrical Component Parts

3.0 QUALIFICATION TESTS

3.1 VIBRATION TEST

3.1.1 Test Procedure

3.1.1.1 Measure Frequency, V_{OH}, V_{OL}, Duty Cycle, Rise/Fall Time and current consumption.

3.1.1.2 Vibrate part in each X, Y, and Z axis
2 hours in each axis
Frequency: 10~55~10 Hz
Amplitude: 0.7~0.9 mm
Sweep: 1.0~2.0 minutes

3.1.1.3 Measure Frequency, V_{OH}, V_{OL}, Duty Cycle, Rise/Fall Time and current consumption.

3.1.2 Test Performance Requirements and Results

3.1.2.1 Sample Size: 10

3.1.2.2 Frequency of unit under test: 50.00 MHz

3.2.2.3 Deviation Data

VIBRATION PERFORMANCE DEVIATION REQUIREMENTS	**VIBRATION PERFORMANCE DEVIATION RESULTS**			
TESTS	**AVE.**	**STD.**	**MIN.**	**MAX.**
Frequency Deviation: +/- 5.0 ppm maximum	-0.6 ppm	0.67 ppm	-1.7 ppm	0.7 ppm
Output Level Deviation, V_{OH} +/- 0.2 volts max.	0 volts	0 volts	0 volts	0 volts
Output Level Deviation, V_{OL} +/- 0.2 volts max.	0 volts	0 volts	0 volts	0 volts
Duty Cycle Ratio A Deviation: 3.0 % max.	-0.1 %	0.32 %	-1 %	0 %
Duty Cycle Ratio B Deviation: 3.0 % max.	0.1 %	0.32 %	0 %	1 %
Rise Time Deviation: 1 nsec max.	0.02 nsec	0.04 nsec	0 nsec	0.1 nsec
Fall Time Deviation: 1 nsec max.	-0.01 nsec	0.03 nsec	-0.1 nsec	0 nsec
Current Consumption Deviation: 1 ma max.	0.02 ma	0.04 ma	0 ma	0.1 ma

3.1.2.4 Results of Vibration Test

Number Units Pass: 10
Number Units Fail: 0

3.1.3 Test Performance Requirements and Results

3.1.3.1 Sample Size: 10

3.1.3.2 Frequency of unit under test: 19.6608 MHz

3.2.3.3 Deviation Data

VIBRATION PERFORMANCE DEVIATION REQUIREMENTS	**VIBRATION PERFORMANCE DEVIATION RESULTS**			
TESTS	**AVE.**	**STD.**	**MIN.**	**MAX.**
Frequency Deviation: +/- 5.0 ppm maximum	0.21 ppm	0.38 ppm	-0.4 ppm	1.0 ppm
Output Level Deviation, V_{OH} +/- 0.2 volts max.	0 volts	0 volts	0 volts	0 volts
Output Level Deviation, V_{OL} +/- 0.2 volts max	0 volts	0 volts	0 volts	0 volts
Duty Cycle Ratio A Deviation: 3.0 % max.	0 %	0 %	0 %	0 %
Duty Cycle Ratio B Deviation: 3.0 % max.	0 %	0 %	0 %	0 %
Rise Time Deviation: 1 nsec max.	-0.02 nsec	0.04 nsec	-0.1 nsec	0nsec
Fall Time Deviation: 1 nsec max.	-0.02 nsec	0.04 nsec	-0.1 nsec	0 nsec
Current Consumption Deviation: 1 ma max.	0 ma	0. ma	0 ma	0 ma

3.1.3.4 Results of Vibration Test

Number Units Pass: 10
Number Units Fail: 0

3.2 DROP -TEST

3.2.1 Test Procedure

3.2.1.1 Measure Frequency, V_{OH}, V_{OL}, Duty Cycle, Rise/Fall Time and current consumption.

3.2.1.2 Drop freely on a hard wooden plate three times from a height of 75 cm.

3.2.1.3 Measure Frequency, V_{OH}, V_{OL}, Duty Cycle, Rise/Fall Time and current consumption.

3.2.2 Test Performance Requirements and Results

3.2.2.1 Sample Size: 10

3.2.2.2 Frequency of unit under test: 50.00 MHz

3.2.2.3 Deviation Data

DROP TEST PERFORMANCE DEVIATION REQUIREMENTS	**DROP TEST PERFORMANCE DEVIATION RESULTS**			
TESTS	**AVE.**	**STD.**	**MIN.**	**MAX.**
Frequency Deviation: +/- 5.0 ppm maximum	-0.03 ppm	0.47 ppm	-0.8 ppm	0.8 ppm
Output Level Deviation, V_{OH} +/- 0.2 volts max	0 volts	0 volts	0 volts	0 volts
Output Level Deviation, V_{OL} +/- 0.2 volts max.	0 volts	0 volts	0 volts	0 volts
Duty Cycle Ratio A Deviation: 3.0 % max.	0.1 %	0.88 %	-1 %	1 %
Duty Cycle Ratio B Deviation: 3.0 % max.	-0.1 %	0.88 %	-1 %	1 %
Rise Time Deviation: 1 nsec max.	0 nsec	0.05 nsec	-0.1 nsec	0.1 nsec
Fall Time Deviation: 1 nsec max.	0.03 nsec	0.07 nsec	-0.1 nsec	0.1 nsec
Current Consumption Deviation: 1 ma max.	0.01 ma	0.17 ma	-0.3 ma	0.3 ma

3.2.2.4 Results of Drop Test
Number Units Pass: 10
Number Units Fail: 0

3.2.3 Test Performance Requirements and Results

3.2.3.1 Sample Size: 10

3.2.3.2 Frequency of unit under test: 19.6608 MHz

3.2.3.3 Deviation Data

DROP TEST PERFORMANCE DEVIATION REQUIREMENTS	**DROP TEST PERFORMANCE DEVIATION RESULTS**			
TESTS	**AVE.**	**STD.**	**MIN.**	**MAX.**
Frequency Deviation: +/- 5.0 ppm maximum	0.03 ppm	0.54 ppm	-1.0 ppm	0.7 ppm
Output Level Deviation, V_{OH} +/- 0.2 volts max	0 volts	0 volts	0 volts	0 volts
Output Level Deviation, V_{OL} +/- 0.2 volts max.	0 volts	0 volts	0 volts	0 volts
Duty Cycle Ratio A Deviation: 3.0 % max.	-0.1 %	0.32 %	-1 %	0 %
Duty Cycle Ratio B Deviation: 3.0 % max.	0.1 %	0.32 %	0 %	1 %
Rise Time Deviation: 1 nsec max.	0.01 nsec	0.03 nsec	0 nsec	0.1 nsec
Fall Time Deviation: 1 nsec max.	0 nsec	0 nsec	0 nsec	0 nsec
Current Consumption Deviation: 1 ma max.	0.01 ma	0.03 ma	0 ma	0.1 ma

3.2.3.4 Results of Drop Test

Number Units Pass: 10

Number Units Fail: 0

3.3 SOLDERABILITY AND RESISTANCE TO SOLDERING HEAT

3.3.1 Test Procedure

3.3.1.1 Measure Frequency, V_{OH}, V_{OL}, Duty Cycle, Rise/Fall Time and current consumption.

3.3.1.2 Prepare unit with solder paste on electrodes so that >95% of the electrode is covered with solder.

3.3.1.3 Let the unit pass through the reflow oven. Pre-heat at a temperature of 150 +/-10^{O}C within 1 minute and reflow at a peak temperature of 230 +/-5^{O}C for 10 seconds maximum.

3.3.1.4 Measure Frequency, V_{OH}, V_{OL}, Duty Cycle, Rise/Fall Time and current consumption.

3.3.2 Test Performance Requirements and Results

3.3.2.1 Sample Size: 10

3.3.2.2 Frequency of unit under test: 50.00 MHz

3.3.2.3 Deviation Data

RESISTANCE TO SOLDERING HEAT PERFORMANCE DEVIATION REQUIREMENTS	**RESISTANCE TO SOLDERING HEAT PERFORMANCE DEVIATION RESULTS**			
TESTS	**AVE.**	**STD.**	**MIN.**	**MAX.**
Frequency Deviation: +/- 5.0 ppm maximum	0.08 ppm	0.48 ppm	-0.8 ppm	0.6 ppm
Output Level Deviation, V_{OH} +/- 0.2 volts max.	0 volts	0 volts	0 volts	0 volts
Output Level Deviation, V_{OL} +/- 0.2 volts max.	0 volts	0 volts	0 volts	0 volts
Duty Cycle Ratio A Deviation: 3.0 % max.	0 %	0.94 %	-1 %	2 %
Duty Cycle Ratio B Deviation: 3.0 % max.	0 %	0.94 %	-2 %	1 %
Rise Time Deviation: 1 nsec max.	0.01 nsec	0.06 nsec	-0.1 nsec	0.1 nsec
Fall Time Deviation: 1 nsec max.	0.03 nsec	0.07 nsec	-0.1 nsec	0.1 nsec
Current Consumption Deviation: 1 ma max.	0.03 ma	0.22 ma	-0.4 ma	0.3 ma

3.3.2.4 Results of Resistance to Soldering Heat Test
Number Units Pass: 10
Number Units Fail: 0

3.3.2.5 Results of Solderability Test
All units solder area 100% covered
Number Units Pass: 10
Number Units Fail: 0

3.3.3 Test Performance Requirements and Results

3.3.3.1 Sample Size: 10

3.3.3.2 Frequency of unit under test: 19.6608 MHz

3.3.3.3 Deviation Data

RESISTANCE TO SOLDERING HEAT PERFORMANCE DEVIATION REQUIREMENTS	**RESISTANCE TO SOLDERING HEAT PERFORMANCE DEVIATION RESULTS**			
TESTS	**AVE.**	**STD.**	**MIN.**	**MAX.**
Frequency Deviation: +/- 5.0 ppm maximum	1.1 ppm	1.56 ppm	-0.3 ppm	4.2 ppm
Output Level Deviation, V_{OH} +/- 0.2 volts max.	0 volts	0 volts	0 volts	0 volts
Output Level Deviation, V_{OL} +/- 0.2 volts max.	0 volts	0 volts	0 volts	0 volts
Duty Cycle Ratio A Deviation: 3.0 % max.	0.1 %	0.32 %	0 %	1 %
Duty Cycle Ratio B Deviation: 3.0 % max.	-0.1 %	0.32 %	-1 %	0 %
Rise Time Deviation: 1 nsec max.	-0.01 nsec	0.03 nsec	-0.1 nsec	0 nsec
Fall Time Deviation: 1 nsec max.	0.01 nsec	0.03 nsec	0 nsec	0.1 nsec
Current Consumption Deviation: 1 ma max.	-0.01 ma	0.03 ma	-0.1 ma	0 ma

3.3.3.4 Results of Resistance to Soldering Heat Test
Number Units Pass: 10
Number Units Fail: 0

3.3.3.5 Results of Solderability Test
All units solder area 100% covered
Number Units Pass: 10
Number Units Fail: 0

3.4 PACKAGE LEAK RATE

3.4.1 Test Procedure

3.3.1.1 Create a vacuum in the chamber.

3.3.1.2 Back fill chamber at 2 atm for 2 hours.

3.3.1.3 Check helium leak rate with mass spectrometer He leak detector.

3.3.1.4 Measure Frequency, V_{OH}, V_{OL}, Duty Cycle, Rise/Fall Time and current consumption.

3.4.2 Test Performance Requirements and Results

3.4.2.1 Sample Size: 10

3.4.2.2 Frequency of unit under test: 50.00 MHz

3.4.2.3 Test Results

LEAK TEST PERFORMANCE REQUIREMENTS	**LEAK TEST PERFORMANCE RESULTS**			
TESTS	**AVE.**	**STD.**	**MIN.**	**MAX.**
Leak Rate, 1 x 10E-08 atm-cc/sec He max.	4.89 E-09	0.18 E-09	4.6 E-09	5.1 E-09

3.4.2.1 Results of He Leak Test
Number Units Pass: 10
Number Units Fail: 0

3.4.3 Test Performance Requirements and Results

3.4.3.1 Sample Size: 10

3.4.3.2 Frequency of unit under test: 19.6608 MHz

3.4.3.3 Test Results

LEAK TEST PERFORMANCE REQUIREMENTS	LEAK TEST PERFORMANCE RESULTS			
TESTS	**AVE.**	**STD.**	**MIN.**	**MAX.**
Leak Rate, 1 x 10E-08 atm-cc/sec He max.	4.87 E-09	0.16 E-09	4.7 E-09	5.1 E-09

3.4.3.1 Results of He Leak Test
Number Units Pass: 10
Number Units Fail: 0

3.5 RESISTANCE TO HEAT

3.5.1 Test Procedure

3.5.1.1 Measure Frequency, V_{OH}, V_{OL}, Duty Cycle, Rise/Fall Time and current consumption at ambient temperature.

3.5.1.2 Place unit in chamber kept at a temperature of +125 +/-2^{O}C for 240 hours.

3.5.1.3 Remove from chamber and measure Frequency, V_{OH}, V_{OL}, Duty Cycle, Rise/Fall Time and current consumption after 1 hour at ambient temperature.

3.5.2 Test Performance Requirements and Results

3.5.2.1 Sample Size: 10

3.5.2.2 Frequency of unit under test: 50.00 MHz

3.5.2.3 Deviation Data

RESISTANCE TO HEAT PERFORMANCE DEVIATION REQUIREMENTS	**RESISTANCE TO HEAT PERFORMANCE DEVIATION RESULTS**			
TESTS	**AVE.**	**STD.**	**MIN.**	**MAX.**
Frequency Deviation: +/- 5.0 ppm maximum	-0.07 ppm	0.36 ppm	-0.6 ppm	0.5 ppm
Output Level Deviation, V_{OH} +/- 0.2 volts max.	0 volts	0 volts	0 volts	0 volts
Output Level Deviation, V_{OL} +/- 0.2 volts max.	0 volts	0 volts	0 volts	0 volts
Duty Cycle Ratio A Deviation: 3.0 % max.	-0.1 %	0.32 %	-1 %	0 %
Duty Cycle Ratio B Deviation: 3.0 % max.	0.1 %	0.32 %	0 %	1 %
Rise Time Deviation: 1 nsec max.	0 nsec	0 nsec	0 nsec	0 nsec
Fall Time Deviation: 1 nsec max.	0.01 nsec	0.03 nsec	0 nsec	0.1 nsec
Current Consumption Deviation: 1 ma max.	0.01 ma	0.06 ma	-0.1 ma	0.1 ma

3.5.2.4 Results of Resistance to Heat Test
Number Units Pass: 10
Number Units Fail: 0

3.5.3 Test Performance Requirements and Results

3.5.3.1 Sample Size: 10

3.5.3.2 Frequency of unit under test: 19.6608 MHz

3.5.3.3 Deviation Data

RESISTANCE TO HEAT PERFORMANCE DEVIATION REQUIREMENTS	**RESISTANCE TO HEAT PERFORMANCE DEVIATION RESULTS**			
TESTS	**AVE.**	**STD.**	**MIN.**	**MAX.**
Frequency Deviation: +/- 5.0 ppm maximum	-0.037 ppm	0.25 ppm	-0.4 ppm	0.2 ppm
Output Level Deviation, V_{OH} +/- 0.2 volts max.	0 volts	0 volts	0 volts	0 volts
Output Level Deviation, V_{OL} +/- 0.2 volts max.	0 volts	0 volts	0 volts	0 volts
Duty Cycle Ratio A Deviation: 3.0 % max.	0.1 %	0.32 %	0 %	1 %
Duty Cycle Ratio B Deviation: 3.0 % max.	-0.1 %	0.32 %	-0.1 %	0 %
Rise Time Deviation: 1 nsec max.	-0.2 nsec	-0.01 nsec	0.7 nsec	0.1 nsec
Fall Time Deviation: 1 nsec max.	0.02 nsec	0.04 nsec	0 nsec	0.1 nsec
Current Consumption Deviation: 1 ma max.	0 ma	0 ma	0 ma	0 ma

3.5.3.4 Results of Resistance to Heat Test

Number Units Pass: 10

Number Units Fail: 0

3.6 RESISTANCE TO COLD

3.6.1 Test Procedure

3.6.1.1 Measure Frequency, V_{OH}, V_{OL}, Duty Cycle, Rise/Fall Time and current consumption at ambient temperature.

3.6.1.2 Place unit in chamber kept at a temperature of -40 +/-3^{O}C for 240 hours.

3.6.1.3 Remove from chamber and measure Frequency, V_{OH}, V_{OL}, Duty Cycle, Rise/Fall Time and current consumption after 1 hour at ambient temperature.

3.6.2 Test Performance Requirements and Results

3.6.2.1 Sample Size: 10

3.6.2.2 Frequency of unit under test: 50.00 MHz

3.6.2.3 Deviation Data

RESISTANCE TO COLD PERFORMANCE DEVIATION REQUIREMENTS	**RESISTANCE TO COLD PERFORMANCE DEVIATION RESULTS**			
TESTS	**AVE.**	**STD.**	**MIN.**	**MAX.**
Frequency Deviation: +/- 5.0 ppm maximum	-0.09 ppm	0.59 ppm	-1.1 ppm	1.0 ppm
Output Level Deviation, V_{OH} +/- 0.2 volts max.	0 volts	0 volts	0 volts	0 volts
Output Level Deviation, V_{OL} +/- 0.2 volts max.	0 volts	0 volts	0 volts	0 volts
Duty Cycle Ratio A Deviation: 3.0 % max.	0 %	0.47 %	-1 %	1 %
Duty Cycle Ratio B Deviation: 3.0 % max.	0 %	0.47 %	-1 %	1 %
Rise Time Deviation: 1 nsec max.	0 nsec	0.05 nsec	-0.1 nsec	0.1 nsec
Fall Time Deviation: 1 nsec max.	0 nsec	0.05 nsec	-0.1 nsec	0.1 nsec
Current Consumption Deviation: 1 ma max.	0 ma	0.05 ma	-0.1 ma	0.1 ma

3.6.2.4 Results of Resistance to Cold Test
Number Units Pass: 10
Number Units Fail: 0

3.6.3 Test Performance Requirements and Results

3.6.3.1 Sample Size: 10

3.6.3.2 Frequency of unit under test: 19.6608 MHz

3.6.3.3 Deviation Data

RESISTANCE TO COLD PERFORMANCE DEVIATION REQUIREMENTS	**RESISTANCE TO COLD PERFORMANCE DEVIATION RESULTS**			
TESTS	**AVE.**	**STD.**	**MIN.**	**MAX.**
Frequency Deviation: +/- 5.0 ppm maximum	-0.05 ppm	0.69 ppm	-1.5 ppm	1.0 ppm
Output Level Deviation, V_{OH} +/- 0.2 volts max.	0 volts	0 volts	0 volts	0 volts
Output Level Deviation, V_{OL} +/- 0.2 volts max.	0 volts	0 volts	0 volts	0 volts
Duty Cycle Ratio A Deviation: 3.0 % max.	0.1 %	0.32 %	0 %	1 %
Duty Cycle Ratio B Deviation: 3.0 % max.	-0.1 %	0.32 %	-1 %	1 %
Rise Time Deviation: 1 nsec max.	-0.01 nsec	0.03 nsec	-0.1 nsec	0 nsec
Fall Time Deviation: 1 nsec max.	0.03nsec	0.07 nsec	0 nsec	0.2 nsec
Current Consumption Deviation: 1 ma max.	-0.01 ma	0.03 ma	-0.1 ma	0 ma

3.6.3.4 Results of Resistance to Cold Test
Number Units Pass: 10
Number Units Fail: 0

3.7 RESISTANCE TO THERMAL SHOCK

3.7.1 Test Procedure

3.7.1.1 Measure Frequency, V_{OH}, V_{OL}, Duty Cycle, Rise/Fall Time and current consumption at ambient temperature.

3.7.1.2 Place unit in chamber and subject unit to 10 cycles of temperature as follows: -40^{O}C for 30 minutes. Transfer to $+85^{O}$C in 60 seconds and soak unit for 30 minutes. Transfer to -40^{O}C in 60 seconds. Repeat cycle 10 times.

3.7.1.3 Remove from chamber and measure Frequency, VOH, VOL, Duty Cycle, Rise/Fall Time and current consumption after 1 hour at ambient temperature.

3.7.2 Test Performance Requirements and Results

3.7.2.1 Sample Size: 10

3.7.2.2 Frequency of unit under test: 50.00 MHz

3.7.2.3 Deviation Data

RESISTANCE TO THERMAL SHOCK PERFORMANCE DEVIATION REQUIREMENTS	RESISTANCE TO THERMAL SHOCK PERFORMANCE DEVIATION RESULTS			
TESTS	AVE.	STD.	MIN.	MAX.
Frequency Deviation: +/- 5.0 ppm maximum	-0.07 ppm	0.36 ppm	-0.05 ppm	0.5 ppm
Output Level Deviation, V_{OH} +/- 0.2 volts max	0 volts	0 volts	0 volts	0 volts
Output Level Deviation, V_{OL} +/- 0.2 volts max.	0 volts	0 volts	0 volts	0 volts
Duty Cycle Ratio A Deviation: 3.0 % max.	0 %	0 %	0 %	0 %
Duty Cycle Ratio B Deviation: 3.0 % max.	0 %	0 %	0 %	0 %
Rise Time Deviation: 1 nsec max.	0.02 nsec	0.04 nsec	0 nsec	0.1 nsec
Fall Time Deviation: 1 nsec max.	-0.01 nsec	0.03 nsec	-0.1 nsec	0 nsec
Current Consumption Deviation: 1 ma max.	0 ma	0.07 ma	-0.1 ma	0.1 ma

3.7.2.4 Results of Resistance to Thermal Shock

Number Units Pass: 10

Number Units Fail: 0

3.7.3 Test Performance Requirements and Results

3.7.3.1 Sample Size: 10

3.7.3.2 Frequency of unit under test: 19.6608 MHz

3.7.3.3 Deviation Data

RESISTANCE TO THERMAL SHOCK PERFORMANCE DEVIATION REQUIREMENTS	RESISTANCE TO THERMAL SHOCK PERFORMANCE DEVIATION RESULTS			
TESTS	AVE.	STD.	MIN.	MAX.
Frequency Deviation: +/- 5.0 ppm maximum	-0.42 ppm	0.76 ppm	-2.0 ppm	0.2 ppm
Output Level Deviation, V_{OH} +/- 0.2 volts max.	0 volts	0 volts	0 volts	0 volts
Output Level Deviation, V_{OL} +/- 0.2 volts max.	0 volts	0 volts	0 volts	0 volts
Duty Cycle Ratio A Deviation: 3.0 % max.	0.1 %	0.32 %	0 %	1 %
Duty Cycle Ratio B Deviation: 3.0 % max.	-0.1 %	0.32 %	-0.1 %	0 %
Rise Time Deviation: 1 nsec max.	-0.01 nsec	0.03 nsec	-0.1 nsec	0 nsec
Fall Time Deviation: 1 nsec max.	0.01 nsec	0.03 nsec	0 nsec	0.1 nsec
Current Consumption Deviation: 1 ma max.	0 ma	0 ma	0 ma	0 ma

3.7.3.4 Results of Resistance to Thermal Shock
Number Units Pass: 10
Number Units Fail: 0

3.8 RESISTANCE TO HUMIDITY

3.8.1 Test Procedure

3.8.1.1 Measure Frequency, VOH, VOL, Duty Cycle, Rise/Fall Time and current consumption at ambient temperature.

3.8.1.2 Place unit in chamber kept at +40 +/- 2^{O}C and humidity at 90 to 95 % for 240 hours.

3.8.1.3 Remove from chamber and measure Frequency, VOH, VOL, Duty Cycle, Rise/Fall Time and current consumption after 1 hour at ambient temperature.

3.8.2 Test Performance Requirements and Results

3.8.2.1 Sample Size: 10

3.8.2.2 Frequency of unit under test: 50.00 MHz

3.8.2.3 Deviation Data

RESISTANCE TO HUMIDITY PERFORMANCE DEVIATION REQUIREMENTS	RESISTANCE TO HUMIDITY PERFORMANCE DEVIATION RESULTS			
TESTS	AVE.	STD.	MIN.	MAX.
Frequency Deviation: +/- 5.0 ppm maximum	0.07 ppm	0.27 ppm	-0.035 ppm	0.6 ppm
Output Level Deviation, V_{OH} +/- 0.2 volts max.	0 volts	0 volts	0 volts	0 volts
Output Level Deviation, V_{OL} +/- 0.2 volts max.	0 volts	0 volts	0 volts	0 volts
Duty Cycle Ratio A Deviation: 3.0 % max.	-0.2 %	0.42 %	-1 %	0 %
Duty Cycle Ratio B Deviation: 3.0 % max.	0.2 %	0.42 %	0 %	1 %
Rise Time Deviation: 1 nsec max.	0.03 nsec	0.05 nsec	0 nsec	0.1 nsec
Fall Time Deviation: 1 nsec max.	0 nsec	0 nsec	0 nsec	0 nsec
Current Consumption Deviation: 1 ma max.	0.01 ma	0.03 ma	0 ma	0.1 ma

3.8.2.4 Results of Resistance to Humidity
Number Units Pass: 10
Number Units Fail: 0

3.8.3 Test Performance Requirements and Results

3.8.3.1 Sample Size: 10

3.8.3.2 Frequency of unit under test: 19.6608 MHz

3.8.3.3 Deviation Data

RESISTANCE TO HUMIDITY PERFORMANCE DEVIATION REQUIREMENTS	RESISTANCE TO HUMIDITY PERFORMANCE DEVIATION RESULTS			
TESTS	AVE.	STD.	MIN.	MAX.
Frequency Deviation: +/- 5.0 ppm maximum	0.34 ppm	0.80 ppm	-1.0 ppm	1.5 ppm
Output Level Deviation, V_{OH} +/- 0.2 volts max.	0 volts	0 volts	0 volts	0 volts
Output Level Deviation, V_{OL} +/- 0.2 volts max.	0 volts	0 volts	0 volts	0 volts
Duty Cycle Ratio A Deviation: 3.0 % max.	0 %	0 %	0 %	0 %
Duty Cycle Ratio B Deviation: 3.0 % max.	0 %	0 %	0 %	0 %
Rise Time Deviation: 1 nsec max.	0 nsec	0 nsec	0 nsec	0 nsec
Fall Time Deviation: 1 nsec max.	0.01 nsec	0.07	-0.1 nsec	0.2 nsec
Current Consumption Deviation: 1 ma max.	-0.01 ma	0.03 ma	-0.1 ma	0 ma

3.8.3.4 Results of Resistance to Humidity
Number Units Pass: 10
Number Units Fail: 0

3.9 AGING

3.9.1 Test Procedure

3.9.1.1 Measure Frequency at ambient temperature.

3.9.1.2 Place unit in chamber kept at +85 +/- 3^{O}C under operating voltage for 720 hours.

3.9.1.3 Remove from chamber and measure Frequency after 1 hour at ambient temperature.

3.9.2 Test Performance Requirements and Results

3.9.2.1 Sample Size: 10

3.9.2.2 Frequency of unit under test: 50.00 MHz

3.9.2.3 Deviation Data

AGING PERFORMANCE DEVIATION REQUIREMENTS	AGING PERFORMANCE DEVIATION RESULTS		
TESTS	AVE.	MIN.	MAX.
Frequency Deviation: +/- 5.0 ppm maximum	-2.9 ppm	-3.7 ppm	-1.3 ppm

3.9.2.4 Results of Aging
Number Units Pass: 10
Number Units Fail: 0

3.9.3 Test Performance Requirements and Results

3.9.3.1 Sample Size: 10

3.9.3.2 Frequency of unit under test: 19.6608 MHz

3.9.3.3 Deviation Data

AGING PERFORMANCE DEVIATION REQUIREMENTS	AGING PERFORMANCE DEVIATION RESULTS		
TESTS	AVE.	MIN.	MAX.
Frequency Deviation: +/- 5.0 ppm maximum	-3.9 ppm	-4.8 ppm	-2.1 ppm

3.9.3.4 Results of Aging

Number Units Pass: 10
Number Units Fail: 0

3.10 30 DAY AGING RATE AND PROJECTED LONG TERM AGING

3.10.1 Test Procedure

3.10.1.1 Place unit in an individual chamber kept at +70 +/- 0.5^{O}C. Maintain a temperature stability of +/-0.03^{O}C. Operate unit under operating voltage for 30 days.

3.10.1.2 Measure the reference frequency after 2 hours warm-up.

3.10.1.3 Measure frequency two times per day for 30 days.

3.10.2 Test Performance Requirements and Results

3.10.2.1 Sample Size: 9

3.10.2.2 Frequency of units under test:

1 Unit at 21.884 MHz
3 Units at 10.000 MHz
2 Units at 66.000 MHz
3 Units at 125.000 MHz

3.10.2.3 Deviation Data

AGING PERFORMANCE DEVIATION REQUIREMENTS	AGING PERFORMANCE DEVIATION RESULTS			
TESTS	AVE.	STD.	MIN.	MAX.
Actual Frequency Aging Rate/Day after 30 days at +70^{O}C: +/- 0.15 ppm/day maximum.	-0.037 ppm	-0.024ppm	-0.076ppm	–0.098ppm
Projected Total Frequency Aging at 1 year at +70^{O}C: +/- 15 ppm maximum.	-4.40 ppm	3.26 ppm	-10.54 ppm	0.15 ppm
Projected Total Frequency Aging at 10 years at +70^{O}C: +/- 25 ppm maximum.	-6.49 ppm	4.48 ppm	–14.88 ppm	0.1 ppm
Projected Total Frequency Aging at 15 years at +70^{O}C: +/- 30 ppm maximum.	-6.83 ppm	4.74 ppm	-15.64 ppm	0.09 ppm

3.10.2.4 Results of Aging Rate and Projected Long Term Aging
Number Units Pass: 9
Number Units Fail: 0

3.11 PARAMETER MEASUREMENTS OVER THE TEMPERATURE RANGE

3.11.1 Test Procedure

3.11.1.1 Place unit in chamber; vary the chamber temperature from $-40^{O}C$ to $+85^{O}C$ in $5^{O}C$ steps.

3.11.1.2 Measure Frequency Deviation, VOH, VOL, Duty Cycle, Rise/Fall Time and current consumption at each temperature step.

3.11.2 Test Performance Requirements and Results

3.11.2.1 Sample Size: 5

3.11.2.2 Frequency of unit under test: 19.6608 MHz

3.11.2.3 Test Results Summary

PARAMETER MEASUREMENTS OVER THE TEMPERATURE RANGE PERFORMANCE REQUIREMENTS	PARAMETER MEASUREMENTS OVER THE TEMPERATURE RANGE PERFORMANCE RESULTS	
TESTS	MIN.	MAX.
Frequency Deviation: +/- 50.0 ppm maximum	5.83 ppm	-12.34 ppm
Output Level Deviation, V_{OH} 2.9 volts min.	3.26 volts	3.34 volts
Output Level Deviation, V_{OL} 0.4 volts max.	-0.06 volts	0.02 volts
Duty Cycle Ratio: 45/55 % max.	48.4%	51.6 %
Rise Time: 4 nsec max.	1.27 nsec	1.74 nsec
Fall Time: 4 nsec max.	1.24 nsec	1.78 nsec
Current Consumption: 25 ma max.	2.00 ma	5.88 ma

3.11.2.4 Results of Parameter Measurement over the Temperature Range

Number Units Pass: 5
Number Units Fail: 0

3.11.3 Test Performance Requirements and Results

3.11.3.1 Sample Size: 5

3.11.3.2 Frequency of unit under test: 34.000 MHz

3.11.3.3 Test Results Summary

PARAMETER MEASUREMENTS OVER THE TEMPERATURE RANGE PERFORMANCE REQUIREMENTS	PARAMETER MEASUREMENTS OVER THE TEMPERATURE RANGE PERFORMANCE RESULTS	
TESTS	MIN.	MAX.
Frequency Deviation: +/- 50.0 ppm maximum	7.72 ppm	-12.61 ppm
Output Level Deviation, V_{OH} 2.9 volts min.	3.30 volts	3.58 volts
Output Level Deviation, V_{OL} 0.4 volts max.	-1.08 volts	0.18 volts
Duty Cycle Ratio: 45/55 % max.	47.1 %	52.9 %
Rise Time: 4 nsec max.	1.28 nsec	1.66 nsec
Fall Time: 4 nsec max.	1.15 nsec	1.67 nsec
Current Consumption: 25 ma max.	4.71 ma	7.52 ma

3.11.3.4 Results of Parameter Measurement over the Temperature Range

Number Units Pass: 5
Number Units Fail: 0

3.12 FREQUENCY DEVIATION OVER THE TEMPERATURE RANGE

3.12.1 Test Procedure

3.12.1.1 Place unit in chamber; vary the chamber temperature from $-20^{O}C$ to $+70^{O}C$ in $5^{O}C$ and $10^{O}C$ steps.

3.12.1.2 Measure Frequency Deviation from 44.736 at each temperature step.

3.12.2 Test Performance Requirements and Results

3.12.2.1 Sample Size: 24

3.12.2.2 Frequency of unit under test (f_o): 44.736 MHz

3.12.2.3 Test Results Summary

FREQUENCY DEVIATION OVER THE TEMPERATURE RANGE PERFORMANCE REQUIREMENTS	FREQUENCY DEVIATION OVER THE TEMPERATURE RANGE PERFORMANCE RESULTS			
TESTS	AVE.	STD.	MIN.	MAX.
Freq. Deviation at $+25^{O}C$: +/- 20 ppm max.	-0.29 ppm	2.87 ppm	0 ppm	12.16 ppm
Freq. Dev. > f_o over Temp.: +/- 50 ppm max.	6.81 ppm	3.23 ppm	2.15 ppm	14.88 ppm
Freq. Dev. < f_o over Temp.: +/- 50 ppm max.	-4.50 ppm	2.60 ppm	-0.72 ppm	-10.01 ppm
Total Freq. Deviation : 100 ppm max.	11.30 ppm	4.73 ppm	6.01 ppm	24.89 ppm

3.12.2.4 Results of Parameter Measurement over the Temperature Range

Number Units Pass: 24
Number Units Fail: 0

3.13 PERIOD JITTER

3.13.1 Test Procedure

3.13.1.1 Test unit at +25^{O}C at nominal voltage and load.

3.13.1.2 Measure Period Jitter.

3.13.2 Test Performance Requirements and Results

3.13.2.1 Sample Size: 30

3.13.2.2 Test Results Summary

PERIOD JITTER PERFORMANCE REQUIREMENTS	FREQUENCY JITTER PERFORMANCE RESULTS
TESTS	AVE. STD. DEV.
10 MHz at 3.3 volts: Std. Dev., +/-50 ps	+/- 40.67
10 MHz at 5.0 volts: Std. Dev., +/-50 ps	+/- 10.42
33.33 MHz at 3.3 volts: Std. Dev., +/-40 ps	+/- 38.13
40.96 MHz at 5.0 volts: Std. Dev., +/-30 ps	+/- 17.85
66 MHz at 3.3 volts: Std. Dev., +/-40 ps	+/- 39.40
125 MHz at 5.0 volts: Std. Dev., +/-30 ps	+/- 28.76 ps

3.13.2.4 Results of frequency jitter
Number Units Pass: 30
Number Units Fail: 0