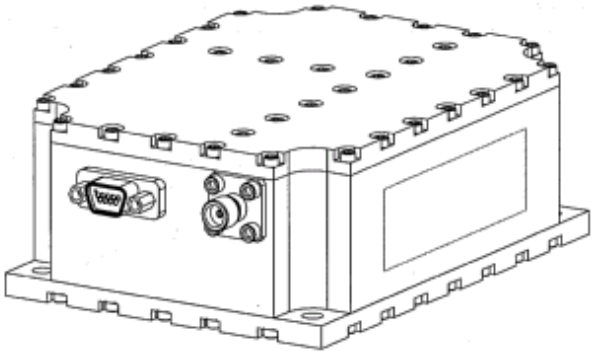
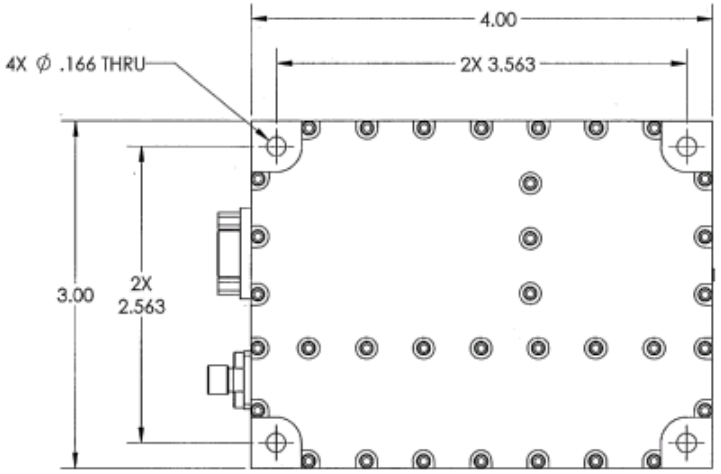
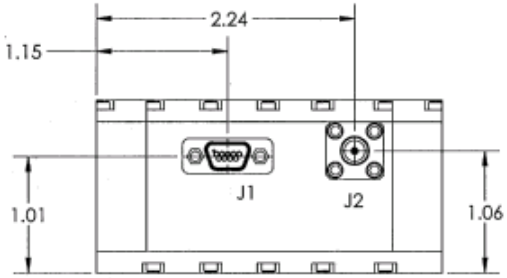
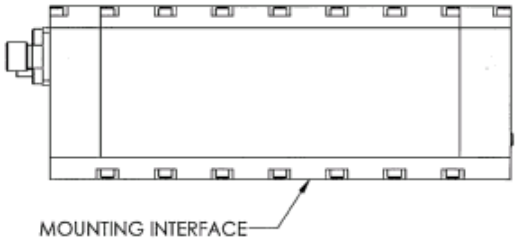
REV	DATE	REVISION RECORD	DWN	AUTH
-	04-02-14	Initial Release	Liz	
A	09-12-16	Update 501-	Liz	









Wenzel Associates, Inc.
Austin, Texas

Title:
10.0 MHz-SC Mini-USO Space Crystal Oscillator

P/N:	Rev:	Date:	Drawn:	Ref:
501-27991	**A**	**09-12-16**		27292

Tolerances: (except as noted) Dimensions are in inches	0.XX Dec:	0.XXX Dec:	FSCM:	Page 1 of 3
	±0.030”	±0.010”	62821	

GENERAL REQUIREMENTS

Material, Design and Construction	MIL-PRF-55310
Parts and Materials List	Supplied
Crystal	Premium Q, Z-swept, synthetic quartz, 1/10 output frequency
Outgassing	TML<1% and CVCM <0.1% per SP-R-002A
Traceability	Semiconductor and passive lot and date code tracking
De-rating	per EEE-INST-002, (JPL-D-8545, alternative)
Soldering	J-STD-001 class 3
Case	Nickel-plated aluminum housing
Finish	Electroless nickel per MIL-C-26074

ELECTRICAL PERFORMANCE

RF Output Frequency	10 MHz (fixed, please specify), sine wave
Frequency Accuracy (initial)	$\pm 1 \times 10^{-8}$ at +25°C
Frequency Stability	$<1 \times 10^{-9}$ over 3°C, -20°C to +60°C, under vacuum
Aging Rate (after 90 days operating)	
1 day	$\pm 2 \times 10^{-10}$
1 year	$\pm 2 \times 10^{-8}$ after 60 days operating
RF Output Power	+12 dBm ±2 dB into 50Ω
RF Output 2nd Harmonic	-30 dBc
RF Output Spurious	≤-100 dBc, 100 KHz to 1 GHz
Phase Noise (Static)	10 MHz
1 Hz	-108 dBc/Hz
10 Hz	-138 dBc/Hz
100 Hz	-155 dBc/Hz
1kHz	-161 dBc/Hz
10kHz	-162 dBc/Hz
Allen Deviation (10 to 10kHz)	1 second 3e-12
	10 seconds 3e-12
	100 seconds 3e-12
Supply voltage	+15 VDC ±5%
Warm-up power	≤8 watts
Warm-up time	≤20 minutes at ambient pressure ≤5×10^{-5} torr
Input power	≤5 watts steady state at ambient pressure ≤5×10^{-5} torr

ENVIRONMENTAL CONDITIONS

Acceptance temperature	-20°C to +60°C
Proto-flight temperature	-20°C to +60°C
Storage temperature	-40°C to +85°C
Ambient pressure	Atmospheric (760 torr), Vacuum (≤5×10^{-5} torr)

MECHANICAL SPECIFICATIONS

Size	4" x 3" x 1.5"
Weight	≤380 grams
Physical	Pressure relief holes, vented

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MODEL DEFINITIONS

PF (Proto-Flight Model)	Design and Construction similar in appearance and identical in form, fit, and function to FM. Developed using best commercial practice, including some commercial parts and materials. EM shall be subjected only to electrical tests, with some environmental testing performed.
FM (Flight Model)	Fabricated to meet all design, construction, and test requirements reference MIL-PRF-55310, Class 1, Product level S. FM shall be subjected to the entire compliment of electrical and environmental acceptance tests listed. Flight Model Space Level, Parts EEE-INST-002, Level 1,2,3 MIL-PRF-3098 Level 2 Crystals, Tested to Table 2, Qual Table 3 by similarity MIL-PRF-19500 / MIL-STD-750 Semiconductors, JANTXV with PIN D, JANTX with PIN D and DPA (5 ea)
Qualification Model	EM unit, when specified, using EEE-INST-002, Level 1,2,3 parts where available. Testing for (1) unit.
501-27991-01	Proto-Flight Model
501-27991-02	Qualification Model
501-27991-03	FM Flight Model

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QUALIFICATION TESTS (Non-flight model, only)

Group I (1 samples)	Visual, Electrical Tests*
Burn-In (operational)	240 hours minimum at +75°C
Group II (1 samples)	
Aging	30 Days
Group III Subgroup 1 (1 sample)	
Random Vibration	11.95 Grms, MIL-STD-202, method 214 I-D, 50 to 2000 Hz, 5 min per axis
Shock	MIL-STD-202, Method 213, Condition A, 50G, 11msec
Group III Subgroup 2 (1 sample)	
Thermal Shock	MIL-STD-202, Method 107, Condition A-1, 25 cycles, -55°C to +85°C
Ambient Pressure	MIL-STD-202, Method 105, at <5 x 10^{-5} torr
Group III Subgroup 3 (1 sample)	
Resistance to Soldering Heat	MIL-STD-202, Method 210, Condition A
Group III Subgroup 4 (1 sample)	
Terminal Strength	MIL-STD-202, Method 211, Condition C, Not applicable for pins <0.25"
Solderability	MIL-STD-202, Method 208
Resistance to Solvents	MIL-STD-202, Method 215 Not applicable when marking is electro-etched
Electrical Tests*	
Radiographics	MIL-STD-202, method 209

ACCEPTANCE TESTS (Flight Model)

Electrical Tests*	
Random Vibration (non-operational)	7.56 Grms overall, MIL-STD-202 Method 214 Test Cond I-B, 50 to 2000 Hz, 5 min per axis
Thermal Shock	MIL-STD-202, Method 107, Condition A, 5 Cycles, -55°C to +85°C
Electrical Tests*	
Burn-In (operational)	240 hours minimum at +75°C
Aging Rate	Projected to 30 days operating
Electrical Tests*	
Radiographics	MIL-STD-202, method 209

***ELECTRICAL TESTS**

Tested at ambient pressure ≤5 x 10^{-5} torr and at -20, +25, and 60°C unless otherwise noted

Warm-Up Power (-20°C only)
Warm-Up Time (-20°C only)
Input Power
Cold Start (-20°C)
Hot Start (+60°C)
RF Output Power
RF Output Harmonics
RF Output Spurious
Frequency Accuracy (+25°C only)
Frequency Stability
Phase Noise - Static (+25°C only, 760 torr)

ANALYSES

Thermal Analysis, Component Stress Analysis

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