



MTS 2000 Series Frequency Synthesizer Data Sheet



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General Description

The MTS2000 series of high performance frequency synthesizers are designed for easy integration into a variety of commercial and defense applications. They are ideal for S-Band, C-Band, Ku-Band (special order), X-Band and Tri-Band satellite and radar applications where a combination of low noise, wide bandwidth, and small step size (down to 1 Hz) are essential. They are based on VertiCom's proprietary YIG oscillator, and are designed to meet the demanding requirements of a variety of commercial and defense applications including radar, data links, receiver systems, test/measurement, and various electronic warfare applications.

Some of the key features of the product line include:

- **Wide Frequency Coverage:** The MTS2000 frequency synthesizer family can cover frequency bands ranging from 2 to 13 GHz.
- **Broad Tuning Range:** Tuning ranges of up to 1.8 GHz are supported.
- **Small Step Sizes:** Standard step size of 1 KHz with options as low as 1 Hz are supported.
- **Outstanding Spectral Purity:** The MTS2000 synthesizer product offers instrument grade phase noise performance and outstanding spectral purity. Typical C-Band phase noise performance is -80 at 100 Hz offsets and -110 at 1 MHz offsets. Please refer to the phase noise plot sections for details.

Typical Application

The MTS2000 frequency synthesizer is typically utilized as the frequency source for a variety of commercial and defense applications including:

- **Satellite**
- **Field portable X-Band terminals**
- **Radar**
- **Control links for unmanned aerial vehicles**
- **Tri-band converters**

Product Selector Guide

Frequency Range	Frequency Span	Step Size
2.0 – 9.0 GHz Standard 9.0 - 13.35 GHz Available	Up to 1.8 GHz	1 KHz Standard 1 Hz Available

Options

Customer specific models available to support frequency ranges from 2.10 GHz up to 13.35 GHz. Standard step size is 1 KHz, optional step size of 1 Hz can be ordered. The communications interface can be specified as parallel or serial RS-422.

Standard Models

Model	Frequency Range	Step Size	Output Power	Satellite Frequency Band
MTS2000-888-21	2.527-3.455 GHz	1 KHz std	14/18 dBm	S-Band
MTS2000-888-22	2.368-3.840 GHz	1 KHz std	14/18 dBm	S-Band
MTS2000-888-23 *	3.500-5.500 GHz	1 KHz std	14/18 dBm	C-Band
MTS2000-888-24	4.810-6.115 GHz	1 KHz std	14/18 dBm	C-Band
MTS2000-888-25	6.410-7.545 GHz	1 KHz std	14/18 dBm	X-Band
MTS2000-888-26	11.922-13.792 GHz	1 KHz std	14/18 dBm	Ku-Band (Special order)

Standard models are provided for evaluation purposes. Actual customer models may be custom configured within the specification parameters provided. Please contact VertiCom to determine which best meets your evaluation criteria.

* RS-422 Serial I/F model

Specifications

Outputs

Parameter	Range / Units	Specification
Frequency Coverage	GHz	2.0 to 9.0 Standard 9.0 to 13.35 Custom
Frequency Tuning Span	GHz	Up to 1.8
Tuning Step Size	KHz	1 kHz Standard 1 Hz Available
Power Level	dBm (min/max)	+14 / +18
Power Variation	dBm (over freq, temp, max)	3.0
Switching Speed	Msec (max)	150
Nominal Impedance	Ohms (typ)	50
Load VSWR	(max)	2:0:1
Harmonic Level	dBc	< -15
Non-Harmonic Spurious	100Hz _≤ foff _≤ 10kHz, dBc	< -65
	10kHz _≤ foff _≤ 100kHz, dBc	< -75
	100kHz _≤ foff, dBc	< -80
Phase Noise		Satellite Frequency Band
		S C X Ku
	100 Hz, dBc/Hz	-84 -80 -77 -75
	1 kHz, dBc/Hz	-94 -95 -87 -85
	10 kHz, dBc/Hz	-100 -110 -92 -95
	100 kHz, dBc/Hz	-120 -115 -110 -100
	1 MHz, dBc/Hz	-130 -130 -125 -110
	10 MHz, dBc/Hz	-140 -135 -130 -125
Phase Error	degrees, peak	20
Connector Type		SMA Jack

Alarm Output

Level	Open Collector, Low=Locked	Locked=<0.7v
Indicator	Red LED, On=Unlocked	Unlocked=Hi-Z

Inputs

Frequency	MHz	5 or 10
Power Level	dBm	0, +/- 3dB
Nominal Impedance	ohms	50
Voltages/Currents:		
+VDC = 15.6 – 20.0	Amps (max)	0.75
+VDC = 5.25 – 5.50	Amps (max)	1.2
Connector Type		SMA Jack

Specifications Continued

Digital Tuning

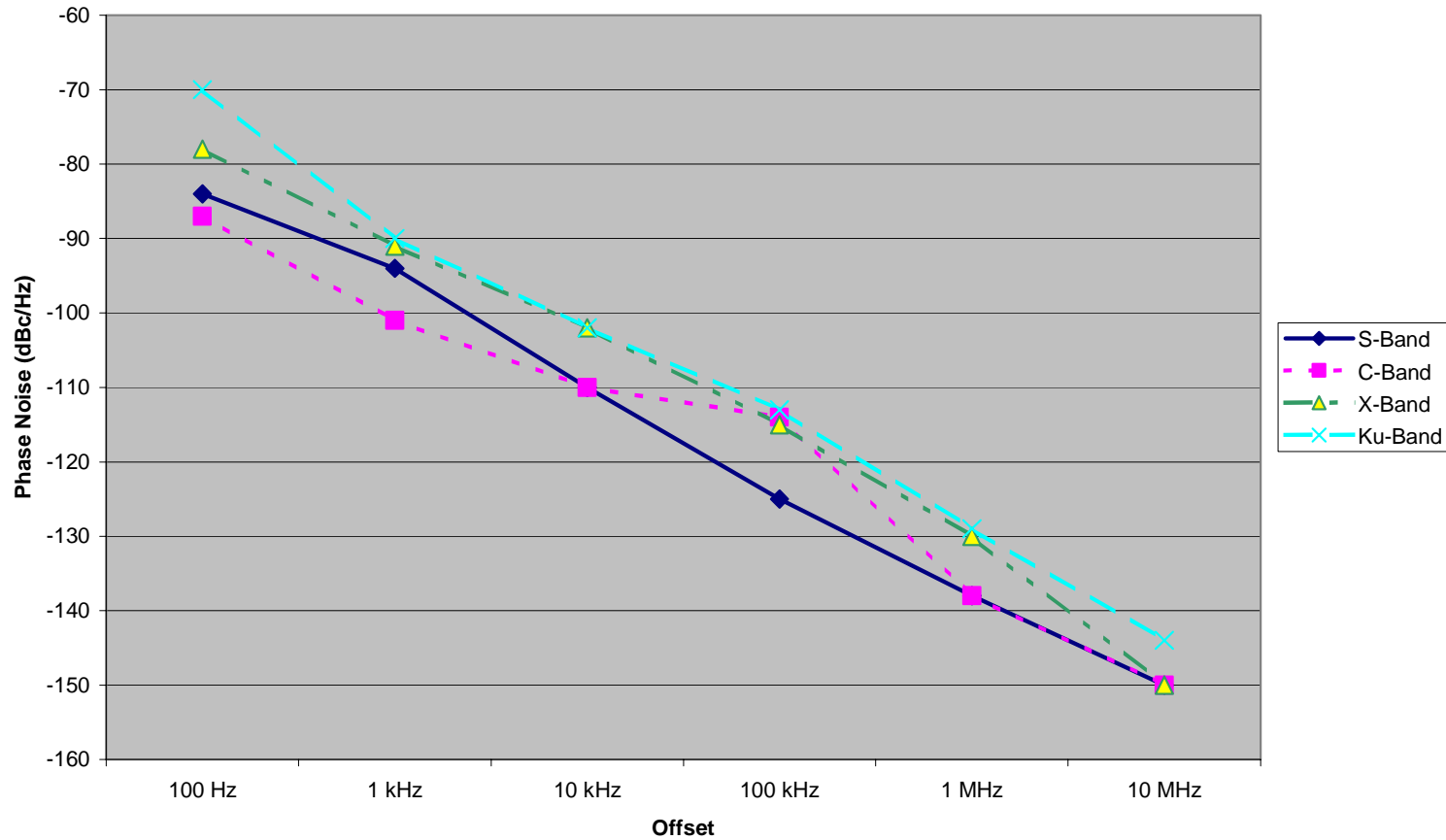
	SERIAL RS-422	PARALLEL
Connector	16 Pin (See Table 2)	50 Pin (See Table 1)
Number of BITS	Depends upon res.	N/A
Level	RS-422	TTL, Inverted
Strobe	N/A	Yes or No
Strobe Pulsewidth	N/A	1.0 to 10.0 usec (min)

Environmental

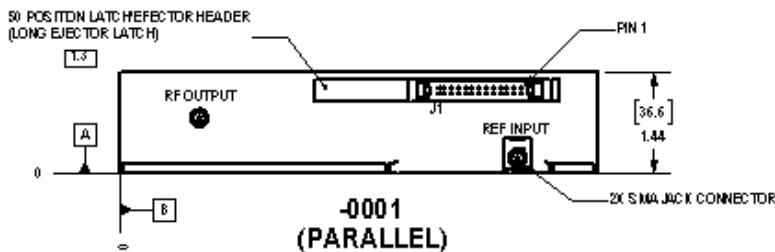
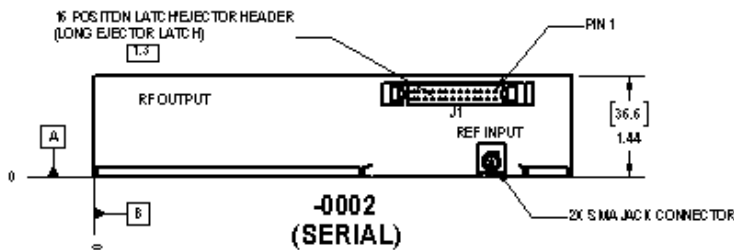
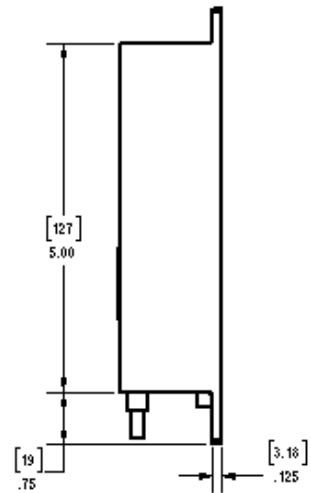
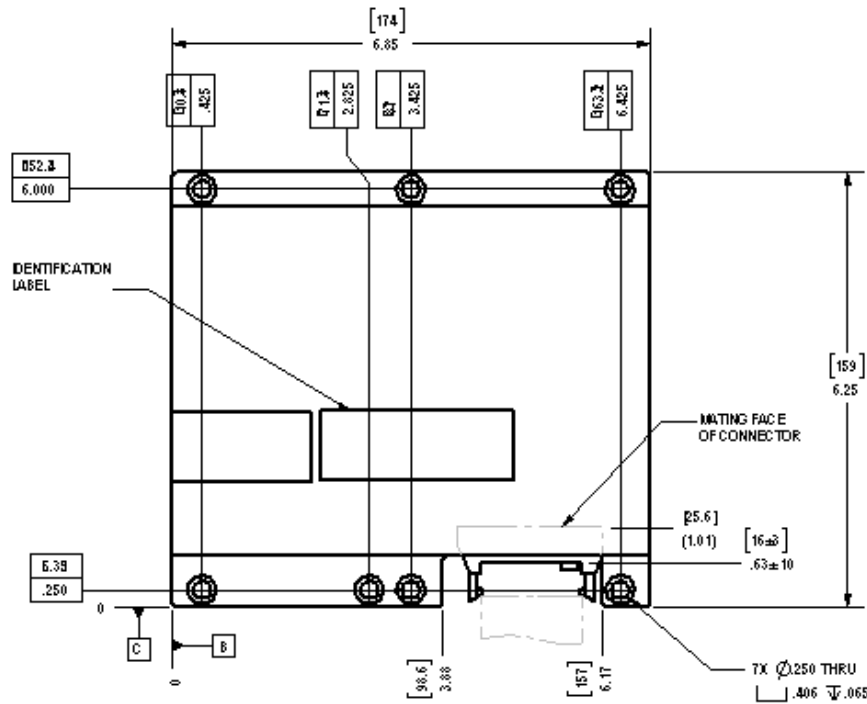
Operating Temperature	Centigrade	0 to +60
Storage Temperature	Centigrade	-40 to +75
Humidity	Relative Humidity	5 – 100, Non-Condensing
Altitude	Feet above sea level	-120 to 20,000

Typical Phase Noise Performance Chart

Satellite Frequency bands S, C, X, Ku



Envelope Drawing



1.2 WEIGHT: < 3.0 POUNDS
[1.36 Kg]

1.3 RECOMMENDED J1 MATING CONNECTOR
(REF ONLY)

RIBBON CABLE CONNECTOR:
3M #3452-7016 (16 POSN)
3M #3425-7050 (50 POSN)

WITH STRAIN RELIEF
OR EQUIVALENT

3RD ANGLE PROJECTION

DIMENSIONS = [MILLIMETERS]
INCHES

TOLERANCES ARE:

DECIMALS

XX ±.03 [+0.8]

.XXX ±.010 [+0.25]

SURFACES

ANGLES ±1°

125
[.2]

INCH DIMENSIONS IN
PARENTHESIS () = REF ONLY

Communication Interface

The communications interface is used to tune and set the frequency within the supported range. See section on Allowable Frequencies for step sizes. A standard Serial RS-422 or Parallel interface can be ordered. See ordering information for selection options. A standard bit rate of 2400 Bps is supported on the Serial interface. Other data rates are available as options.

PARALLEL INTERFACE (-0001)

(Pins J1-3,4,5,6 and 10; See notes 1 and 2 below)

Table 1

PIN	DESCRIPTION	PIN	DESCRIPTION
J1-1	GND	J1-23	CMD6 (1)
J1-2	GND	J1-24	CMD6 (2)
J1-3	+15.6 V (+20V MAX)	J1-25	CMD6 (4)
J1-4	+15.6 V (+20V MAX)	J1-26	CMD6 (8)
J1-5	+5.25 V (+5.5V MAX)	J1-27	CMD5 (1)
J1-6	+5.25 V (+5.5V MAX)	J1-28	CMD5 (2)
J1-7	GND	J1-29	CMD5 (4)
J1-8	RESET / GND	J1-30	CMD5 (8)
J1-9	STROBE	J1-31	CMD4 (1)
J1-10	LOCK ALARM	J1-32	CMD4 (2)
J1-11	CMD9 (1)	J1-33	CMD4 (4)
J1-12	CMD9 (2)	J1-34	CMD4 (8)
J1-13	CMD9 (4)	J1-35	CMD3 (1)
J1-14	CMD9 (8)	J1-36	CMD3 (2)
J1-15	CMD8 (1)	J1-37	CMD3 (4)
J1-16	CMD8 (2)	J1-38	CMD3 (8)
J1-17	CMD8 (4)	J1-39	CMD2 (1)
J1-18	CMD8 (8)	J1-40	CMD2 (2)
J1-19	CMD7 (1)	J1-41	CMD2 (4)
J1-20	CMD7 (2)	J1-42	CMD2 (8)
J1-21	CMD7 (4)	J1-43	CMD1 (1)
J1-22	CMD7 (8)	J1-44	CMD1 (2)
		J1-45	CMD1 (4)
		J1-46	CMD1 (8)
		J1-47	CMD0 (1)
		J1-48	CMD0 (2)
		J1-49	CMD0 (4)
		J1-50	CMD0 (8)

General control bit format cmdx(y)

x=digit 9=msd

y=binary weight

logic 0: > 3.5 v

logic 1: < 0.8 v

Digit 9 is the 1 GHz digit for units
tuning less than 10 GHz

Digit 9 is the 10 GHz digit for units
tuning greater than 10 GHz

Unlock (j1-10) is an open collector output

logic 0: < 0.7 v locked

logic 1: hi-z unlocked

(other options available)

Note 1.

All unused pins should be left open
command change initiated by falling
edge of negative-going strobe. strobe
pulse width > 1.2 u sec

Note 2.

+15.6 supply must be applied before
+5.25 supply.

SERIAL INTERFACE: (-0002)
Table 2

STANDARD PRODUCT CONNECTOR TABULATION	
PIN	DESCRIPTION
J1-1	GND (ID1)
J1-2	GND (ID2)
J1-3	+15.6 V (-20V MAX)
J1-4	+15.6 V (+20V MAX)
J1-5	+5.25 V (+5.5V MAX)
J1-6	+5.25 V (+5.5V MAX)
J1-7	GND
J1-8	RESET / GND
J1-9	GND (ID3)
J1-10	LOCK ALARM
J1-11	Rx +
J1-12	Rx -
J1-13	N / C
J1-14	GND
J1-15	N / C
J1-16	N / C

E1A RS-422 standard hardware interface

standard baud rate: 2400 (other rates available as options)

communication protocol:

the tuning word can be sent in 2 different formats:

- 1) each tuning word will consist of: 1) 1 address byte
- 2) 4 data bytes
- 3) 1 end byte

Address byte: ASCII "A" in binary

Data bytes

: frequency (KHz) in 4 bytes (binary or packed bcd format)

: bit 6 of 4th (most significant) byte = 1 for bcd

: " " " " byte = 0 for binary

End byte : ASCII "K" in binary (for KHz)

Each byte will consist of 10 bits: a start bit (0)

8 data bits

a stop bit (1)

Each byte shall be separated by a 1 msec delay

Each byte to be sent LSB first

Data bytes to be sent least significant byte first

example: freq = 10539720 KHz

in bcd, send 20 97 53 50 (add 4 to the most significant digit)

in binary, send c8 d2 a0 00

In both cases, send each byte with LSB first

Unlock (j1 - 10) is an open collector output

logic 0: <0.7 v locked

logic 1: hi-z unlocked

(other options available)

All Unused Pins Should Be Left Open

Ordering Information

To place an order for an evaluation kit, contact the VertiCom Marketing Department at (707) 570-3362. You can use the following questionnaire to provide pertinent information to VertiCom regarding your specific needs.

Configuration Questionnaire

General Information

Company Name: _____

Address: _____

Phone Number: _____

Fax Number: _____

Email Address: _____

Contact (person making request): _____

Title: _____

Synthesizer Information

Circle One:

External Reference: 5 MHz 10MHz

Frequency Band: See product selector guide for standard models or call to discuss.

Step Size: _____ 1 KHz standard, 1Hz optional special order only

Circle One:

Step Size: 1 KHz (Standard) 1 Hz (Special Order Only)

Communications I/F: Serial RS-422 Parallel
 (-0002) (-0001)

All information will be considered confidential and treated in a confidential manner