APPENDIX E -

Frequency Accuracy and stability test

SDT 5000

Frequency Accuracy and Stability Tests

050-801-0015R01

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1 Purpose

The purpose of this test is to determine the SDT 5000 transmitter frequency accuracy over the operating temperature of the unit.

2 Test Equipment

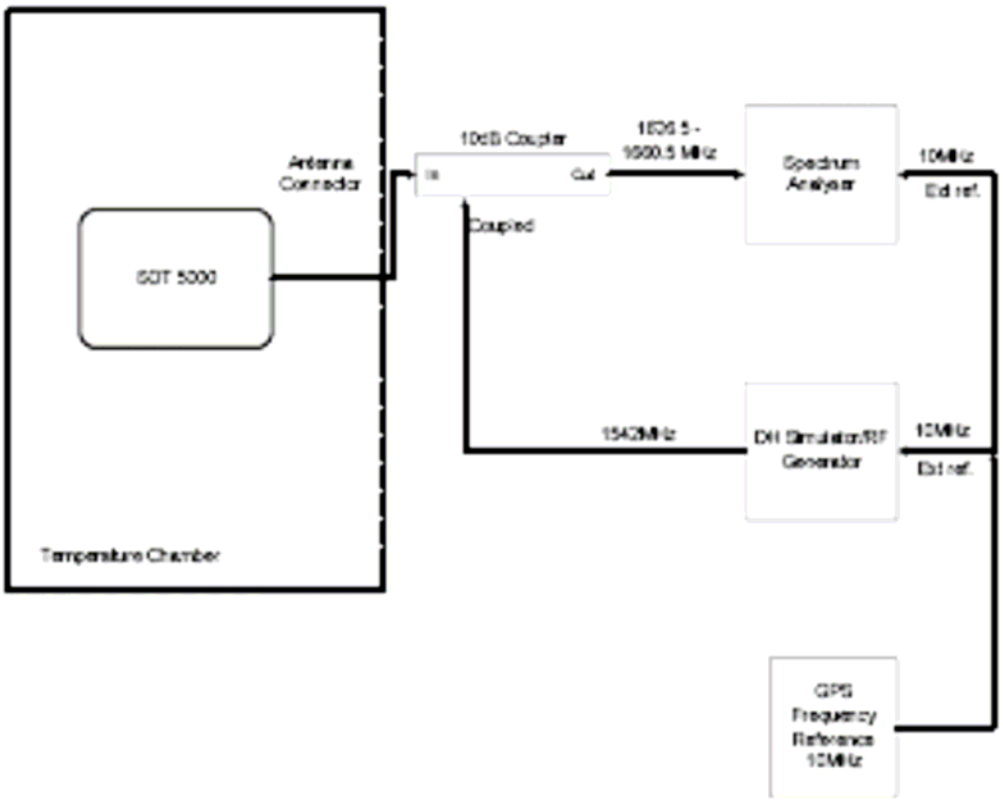
Following is a list of test equipment used.

- **HP Spectrum Analyzer 4396A** with frequency range from 2Hz to 1.8GHz.
- **Boonton 4220** digital RF power meter with ±0.1 dB accuracy.
- **HP 8648B RF signal generator** with frequency range from 0.1 to 2000 MHz.
- **MDS Data Hub Simulator**, a Wireless Matrix propriety test set generating valid MDS frames for calibrating noise, fading, synchronization and frequency stability.
- **Narda Coaxial Directional Coupler** -10dB Model No. 3002B-10
- **Thermotron temperature chamber** for testing between +40°C to +60°C.
- **GW Dual Power Supply Model**: GPC-1850
- **HP GPS 10MHz high stability reference** Z3801A

3 Operation

The transmit frequency accuracy is initially controlled by a TCXO with a typical frequency stability of ±1.5 ppm and max. of ±2.5 ppm over the temperature range between -40 to +60 °C. Once the MSAT Satellite signal is received, the Software Automatic Frequency Control will compensate for any initial frequency offset and will frequency lock the transmitter frequency with the receive frequency.

For this test a Data Hub Simulator and a Spectrum Analyzer are used. A GPS high stability frequency reference is used for both the Data Hub simulator and the Spectrum Analyzer. The transmitter frequency accuracy therefore will be the same as the Data Hub received frequency to within ±50 Hz. The MSAT specification for transmitter frequency error is +/-100Hz (for closed loop frequency control option) relative to the satellite signal.



Transmit Frequency Accuracy and Stability
Test Setup

The transmitter frequency tracking to the DH frequency was tested using the DH test set over the SDT 5000 operating temperature. The transmitter was activated and its frequency was tuned over the operating band and measured to ensure that TX frequency deviation is within the spec limits. The test results are shown in the tables below.
Note: all frequency offsets are normalized to 20°C

Transmit frequency accuracy and stability

Transmitter on 1626.5MHz

Temperature [°C]	Frequency Offset [Hz]		
	Power Supply		
	10V	13.6V	22V
-40	−8.0	−3	−4.0
-30	-10.0	−12.5	−4.5
-20	−6.0	−4.0	-2.0
-10	−5.0	−2.0	−11.0
0	−6.0	−3.5	−9.0
10	1.5	−3.5	−4.0
20	−5.5	−7.5	−5.5
30	−10.0	−12.5	0.5
40	−3.5	−3.5	2.0
50	−9.5	−6.5	−4.5
60	−2.5	5.0	−10.0

Transmitter on 1643.5MHz

Temperature [°C]	Frequency Offset [Hz]		
	Power Supply		
	10V	13.6V	22V
-40	−5.5	−3.5	−5.0
-30	-2.5	-2.5	−4.0
-20	−6.0	-2.0	−10.5
-10	−3.5	−7.0	-2.0
0	−8.0	−10.5	-7.5
10	−7.5	−5.0	−5.5
20	−6.5	−6.0	−8.0
30	−6.5	4.0	−7.0
40	−8.0	−5.5	−1.0
50	−2.5	−6.5	−7.5
60	−2.0	0.0	−6.5

Transmitter on 1660.5MHz

Temperature [°C]	Frequency Offset [Hz]		
	Power Supply		
	10V	13.6V	22V
-40	−3.0	−10.5	−11.0
-30	−7.5	1.0	−9.0
-20	3.0	-11.0	−10.0
-10	−8.5	−3.5	−12.5
0	−8.5	−4.5	−2.0
10	−5.5	−5.0	−2.5
20	−3.5	−5.0	−5.5
30	−3.5	−1.0	−4.5
40	−5.5	−7.0	−2.0
50	−1.5	−4.0	−3.0
60	−5.5	−10.0	−12.0

4 Results

The frequency error of the SDT 5000 transmitter was within specification over the entire operating temperature.