APPLICATION FOR EQUIPMENT AUTHORIZATION

Part 90 Certification
DTC Communications, Inc. Model T-2500-M
APCO Project 25 Compatible
0.625 W Portable Surveillance Transmitter

Under

FCC ID: H25T2500

As a

Licensed Non-Broadcast-Station Transmitter
(Surveillance Transmitter for Law Enforcement)
Title 47 of the CFR, Part 90.210

REPORT DATE
April 3, 2008

Testing and Preparation by:

DTC Communications, Inc.
486 Amherst Street
Nashua, New Hampshire 03063

Testing Laboratories:

RETLIF Testing Laboratories
101 New Boston Road
Goffstown, New Hampshire 03045

INFORMATION REQUIRED UNDER TITLE 47 PART 2

2.1033(a)
This Application for Certification is Filed on Form 731 with all questions
answered. Permanent confidentiality is being requested for the Schematic Diagrams,
Active Parts List, Block Diagrams, and Functional Description. The Application fee
of $1100 will be sent upon initial successful electronic upload of all application
materials.

2.1033(b) N/A

2.1033(c)
(l) The full-name and address of the applicant and manufacturer for certification
    is:
          DTC Communications, Inc.
          486 Amherst St.
          Nashua, NH 03063

(2) The FCC Identifier of the device is **H25T2500**
(3) A copy of the operating instructions is included in the EXHIBITS
(6) Emission:
     NBFM Voice - Designator: **11K0F3E**
     WBFM Voice - Designator: **16K0F3E**
     Project 25 (digital modulation) - Designator: **10K0F1E**
     Note that Emissions Calculations are included in the EXHIBITS

(5) Frequency Range: 150 - 174 MHz
(6) Power:
     0.25 Watt Minimum at 6.0 VDC
     0.50 Watt Minimum at 9.0 VDC
(7) Maximum Power Rating of 0.625 Watt
(8) A 3.5 VDC LDO regulator powers all stages with exception to the final RF PA
     that is connected to the battery source.
(9) There is no Field Tune-up Procedure; therefore it is not included in the
     EXHIBITS.
(10) The Schematic Diagrams are included in the EXHIBITS.
(11) A drawing and photo of the FCC ID label is included in the EXHIBITS.
(12) Photographs of the equipment showing internal components are included in the
     EXHIBITS.
(13) A detailed description of the digital modulation system is included in the
     EXHIBITS.
(14) Test Data as required by (47) 2.1046 through 2.1057, inclusive, is measured
     in accordance with the procedure established in (47) 2.1041.
(15) N/A
(16) N/A
(17) Exclusive of delineated test equipment, no peripheral or accessory devices
     were connected to the Test Sample (DUT/UUT) in order to facilitate operation
     or test. Detailed connection diagrams along with specific test equipment
     descriptions are given in the appropriate sections of the test report.
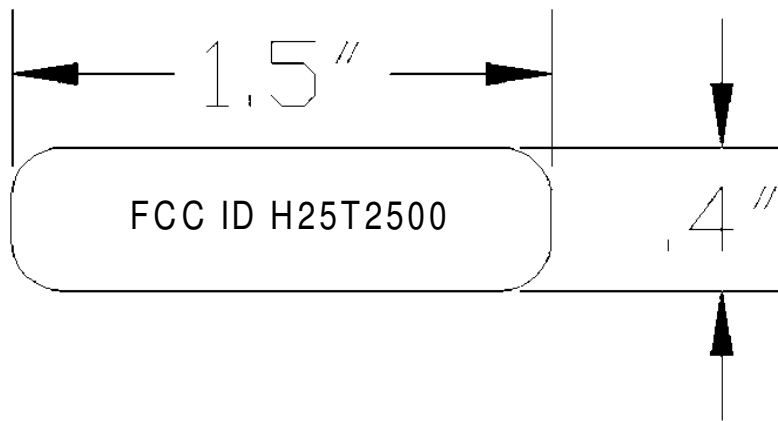(18)
     (a) No means is provided to allow a user to install software.
     (b) N/A
     (c) A high-level diagram showing operational software flow is included in the
         EXHIBITS

FCC Label

FCC Label Placement

RF BOARD

The RF Board performs the following functions:

1) DC Power control / conditioning. – The RF board contains circuitry that provides reverse polarity protection, DC power lead de-coupling and DC power-up control. It also provides a method for orderly power-down required in order to maintain data integrity of the digital integrated voice recorder memory

2) RF Synthesizer. – The RF synthesizer is based on a Digital Phase Locked Loop integrated circuit (IC – U5) that implements the following PLL functions. 1) VCO, 2) Reference-divider, 3) Main-divider, 4) Loop filter, 5) PLL Lock-detection, and 6) VCO output output-divider. The PLL tuning words are calculated by the system microprocessor and sent to the PLL IC via a serial communications interface.

3) PLL Frequency Reference. – IC – U103 is a precision Temperature Compensated Crystal Oscillator (TCXO). The accuracy of all synthesized frequencies are referenced to this frequency standard.

4) DC Power regulators. – The RF board contains the following DC Voltage regulators. 1) A 3.5V linear regulator (IC – U10) that provides Voltage to all of the RF related circuitry (except for the RF PA that operates off of the battery Voltage). 2) A 3.3V switching regulator (IC – U27) that provides Voltage to the system microprocessor located on the digital board. 3) A 1.8V switching regulator (IC – U106) that also provides Voltage to the system microprocessor.

5) Battery Voltage monitoring. – The system microprocessor monitors the battery Voltage by means an A/D converter (IC – U29) located on the RF Board.

6) Modulation Filter. – A 2-Pole linear-phase low-pass filter (IC – U8) is used as a reconstruction filter at the output of the CODEC. This filter removes unwanted energy above 10 kHz.

7) Deviation Control. – The FM deviation is controlled by E-POT IC – U6. The appropriate E-POT settings for the various modulation modes are stored in NV-Ram IC – U14.

8) TCXO Voltage trimming. – The appropriate Voltage calibration settings for the PLL reference frequency are controlled by E-POT IC – U15. The appropriate E-POT settings are stored in NV-Ram IC – U14.

9) External microphone preamplifier. – IC U20 provides 20 dB of gain for the external microphone. The amplified microphone signal is routed to the CODEC located on the Digital Board.

10) RF PA Driver. – Broadband amplifier IC – U1 amplifies the RF signal from the PLL IC to an appropriate level (+15dBm) to drive the RF Power Amplifier.

11) RF Power Amplifier. – LDMOS FET Q3 amplifies the driver RF signal to a level in the range of 250 to 625 mW depending on battery supply Voltage. The power is set by the bias Voltage applied to the Gate of the FET. E-POT IC – U28, sets the appropriate Voltage level. The E-POT setting is stored in NV-Ram IC – U14

12) Harmonic Filter. – A 5 Pole – 2 Zero Harmonic filter is implemented by C10, L4, C111, C11, C15, L5, C110, C12, and C16. This network attenuates harmonic energy above 174 MHz.

RF output power and current drain as a function of frequency and supply Voltage
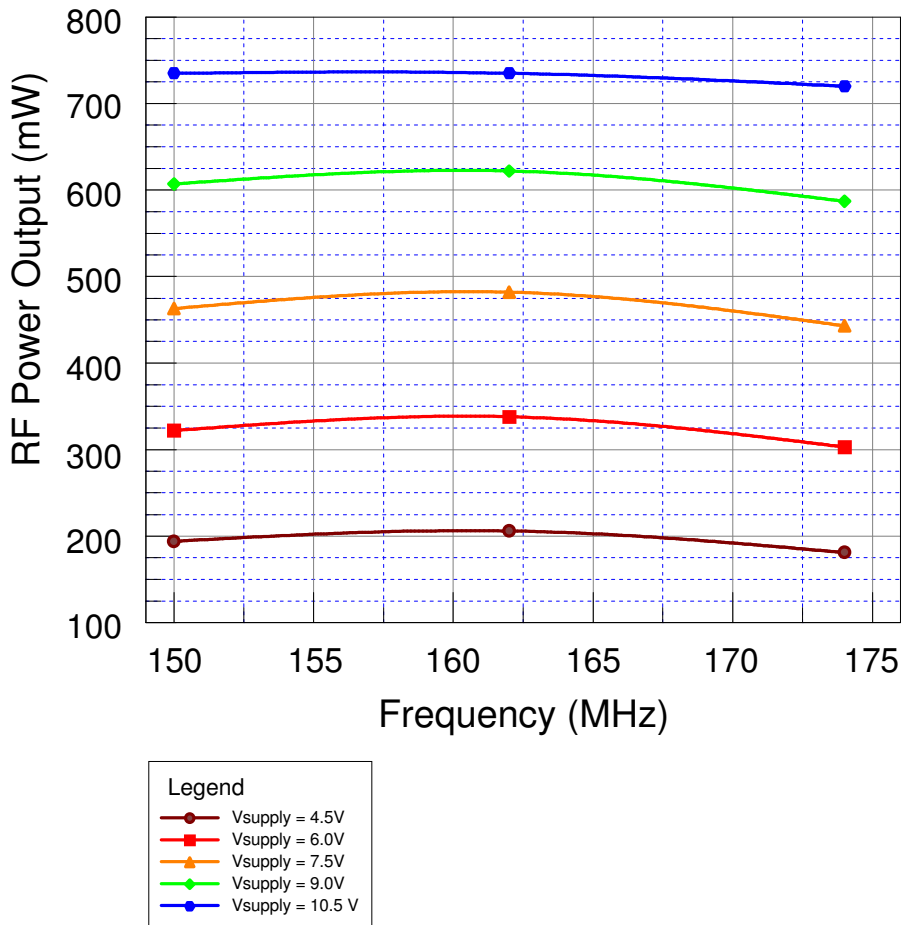
Figure 1, RAW DATA

	4.5V		6.0V		7.5V		9.0V		10.5V*	
Freq (MHz)	Po (mW)	Id (mA)	Po (mW)	Id (mA)	Po (mW)	Id (mA)	Po (mW)	Id (mA)	Po (mW)	Id (mA)
150	194	218	322	218	463	225	607	232	735	240
162	206	224	338	226	482	233	622	239	735	245
174	181	224	303	223	443	227	587	233	720	239

NOTE! 10.5V = maximum over-Voltage, Max rated Voltage = 9.0V

Figure 2

RF Power Output as a Function of Frequency
(Pursuant to FCC Requirement 2.1046a)

T–2500 Spurious Emissions at Antenna Terminals

Relevant FCC Chapters:
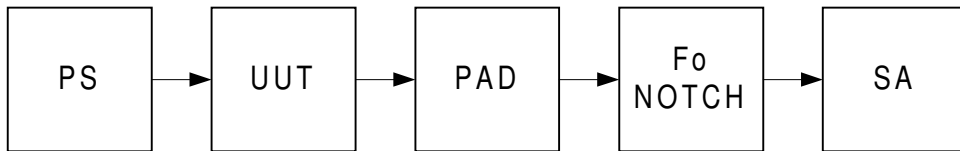2.1051 Measurements required: Spurious emissions at antenna terminals.

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

2.1049 Measurements required: Occupied bandwidth, (c) (1)

90.210 Emission masks, (b) (d)

Test Setup:
The setup for this test is shown below.

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┌──────┐   ┌──────┐   ┌──────┐   ┌───────┐   ┌──────┐
│      │   │      │   │      │   │  Fo   │   │      │
│  PS  │──▶│ UUT  │──▶│ PAD  │──▶│ NOTCH │──▶│  SA  │
│      │   │      │   │      │   │       │   │      │
└──────┘   └──────┘   └──────┘   └───────┘   └──────┘
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    PS – Power Supply – Hewlett–Packard HP6207B – SN 1149A01889
    UUT – T-2500
    Pad – 10 dB Pad – Mini Circuits CAT10
    Fo Notch – High Pass Filter – Mini Circuits NHP-300
    SA-Spectrum Analyzer – Advantest R3162-SN 120401992

Test Method:
The power Supply was set to the maximum rated DUT Voltage of 10.5 VDC (maximum over-Voltage rating). The harmonic suppression was evaluated at the Low, Mid and Highest rated carrier frequency. The spectrum was measured with the unit set to the following mode:

    Un-modulated Carrier
The actual DUT RF Power levels were measured at:

	10.5V*	
Freq (MHz)	Po (mW)	Id (mA)
150	735	240
162	735	245
174	720	239

NOTE! 10.5V = maximum over-Voltage, Max rated Voltage = 9.0V

For the purpose of calculating mask segment (b) (3), the power of the unmodulated carrier was taken to be 1.0 watt, therefore:

    Harmonic Rejection minimum value = 43 + 10log(1.0) = 43dBc

Test Results:
The results of the test are shown in Figures 17A, 17B, and 17C.
The unit under test passes per the criteria established in 2.1051, 2.1049, and 90.210.