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FCC ID: NLKTM14201827

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#### TEST EQUIPMENT LIST

1. Spectrum Analyzer: Hewlett Packard 8566B - Opt 462, w/ preselector 85685A, & Quasi-Peak Adapter HP 85650A, & HP 8449B - OPT H02 Cal. 6/26/98
2. Signal Generator, Hewlett Packard 8640B, cal. 10/1/98
3. Signal Generator, HP 8614A Serial No.2015A07428 cal. 5/27/99
3. Eaton Biconnical Antenna Model 94455-1  
20-200 MHz Serial No. 0997 Cal. 10/30/98
4. Electro-Metric Dipole Kit, 20-1000 MHz, Model TDA-30 10/31/98
5. Electro-Metric Horn 1-18 GHz, Model RGA-180, Cal. 10/30/98
6. Electro-Metric Antennas Model TDA-30/1-4, Cal. 10/15/98
7. Electro-Metric Line Impedance Stabilization Network Model No. EM-7821, Serial No. 101; 100KHz-30MHz 50uH. Cal.11/19/98
8. Electro-Metric Line Impedance Stabilization Network Model No. EM-7820, Serial No. 2682; 10KHz-30MHz 50uH. Cal. 11/19/98
9. Special low loss cable was used above 1 GHz
10. Tenney Temperature Chamber

#### TEST PROCEDURE

GENERAL: This report shall NOT be reproduced except in full without the written approval of TIMCO ENGINEERING, INC.

RADIATION INTERFERENCE: The test procedure used was ANSI STANDARD C63.4-1992 using a HEWLETT PACKARD spectrum analyzer with a preselector. The bandwidth of the spectrum analyzer was 100 kHz with an appropriate sweep speed. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100KHz and the video bandwidth was 300KHz. The ambient temperature of the UUT was with a humidity of .

FORMULA OF CONVERSION FACTORS: The Field Strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB. The gain of the Preselector was accounted for in the Spectrum Analyzer Meter Reading.

Example:

Freq (MHz) METER READING + ACF = FS  
33 20 dBuV + 10.36 dB = 30.36 dBuV/m @ 3m

POWER LINE CONDUCTED INTERFERENCE: The procedure used was ANSI STANDARD C63.4-1992 using a 50uH LISN. Both lines were observed. The bandwidth of the spectrum analyzer was 10kHz with an appropriate sweep speed. The ambient temperature of the UUT was with a humidity of .

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## TEST PROCEDURES CONTINUED

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ANSI STANDARD C63.4-1992 10.1.7 MEASUREMENT PROCEDURES: The unit under test was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The table used for radiated measurements is capable of continuous rotation.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes.

The situation was similar for the conducted measurement except that the table did not rotate. The EUT was setup as described in ANSIC63.4-1992 with the EUT 40 cm from the vertical ground wall.

### CIRCUIT DESCRIPTION:

When the power is turned on the UUT transmitts a CW signal. The crystal controlled oscillator Q1 is coupled to Q2 via C6. From Q2 the signal is coupled through C8 to the low pass filter made up of C10, L3, C11, & L4 which is connected to the antenna. The modulation is provided by the IC U1 when the switched are pushed. The unit is powered by a 9V battery and is self contained.

### ANTENNA AND GROUND CIRCUITRY

This unit makes use of a short, antenna. The antenna is inductively coupled. The antenna is self contained, no provision is made for an external antenna. This unit is powered from a 9.0V battery.

No ground connection is provided. The unit relies on the ground tract of the printed circuit board.

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NAME OF TEST: RADIATION INTERFERENCE

RULES PART NO.: 15.227

REQUIREMENTS: CARRIER FREQUENCY WILL NOT EXCEED 80 dBuV/m AT 3M.  
OUT-OF-BAND EMISSIONS SHALL NOT EXCEED:

30 - 88 MHz	40.0 dBuV/M MEASURED AT 3 METERS
88 - 216 MHz	43.5 dBuV/M
216 - 960 MHz	46.0 dBuV/M
ABOVE 960 MHz	54.0 dBuV/M

TEST DATA:

EMISSION FREQUENCY MHz	METER READING dBuV	COAX LOSS dB	ANTENNA CORRECTION FACTOR	FIELD STRENGTH dBuV/m@3m	PEAK MARGIN dB	ANT. POL.
27.15	49.70	0.20	11.75	61.65	18.35	V
54.30	15.50	0.80	9.60	25.90	14.10	V
108.60	21.70	0.80	8.38	30.88	12.62	H
135.70	18.50	0.80	15.31	34.61	8.89	H
190.00	12.90	0.90	13.68	27.48	16.02	V
217.14	12.40	1.20	12.42	26.02	19.98	H
244.00	11.00	1.20	13.20	25.40	20.60	H
271.40	11.10	1.40	14.00	26.50	19.50	H
162.80	14.20	0.90	17.16	32.26	11.24	H
190.00	15.30	0.90	13.68	29.88	13.63	H

SAMPLE CALCULATION:

$$FSdBuV/m = MR(dBuV) + ACFdB.$$

TEST PROCEDURE: The procedure used was ANSI STANDARD C63.4-1992. The spectrum was scanned from 30 MHz to 1000 MHz. When an emission was found, the table was rotated to produce the maximum signal strength. The antenna was placed in both the horizontal and vertical planes and the worse case emissions were reported. The UUT was tested in 3 orthogonal planes.

TEST RESULTS: THE UNIT DOES MEET THE FCC REQUIREMENTS.

PERFORMED BY: S. S. SANDERS DATE: JUNE 17, 1999

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NAME OF TEST: Occupied Bandwidth

RULES PART NO.: 15.227

REQUIREMENTS: The field strength of any emissions appearing outside the 26.96-27.28 MHz band shall not exceed 100 uV/m (15.209).

THE GRAPH IN EXHIBIT 13-15 REPRESENTS THE WORSE CASE OCCUPIED BANDWIDTH EMISSIONS FOR THIS DEVICE.

METHOD OF MEASUREMENT: A small sample of the transmitter output was fed into the spectrum analyzer and the attached plot was taken. The vertical scale is set to -10 dBm per division. The horizontal scale is set to 5 kHz per division.

TEST RESULTS: The unit DOES meet the FCC requirements.

PERFORMED BY: S. S. SANDERS JUNE 17, 1999

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